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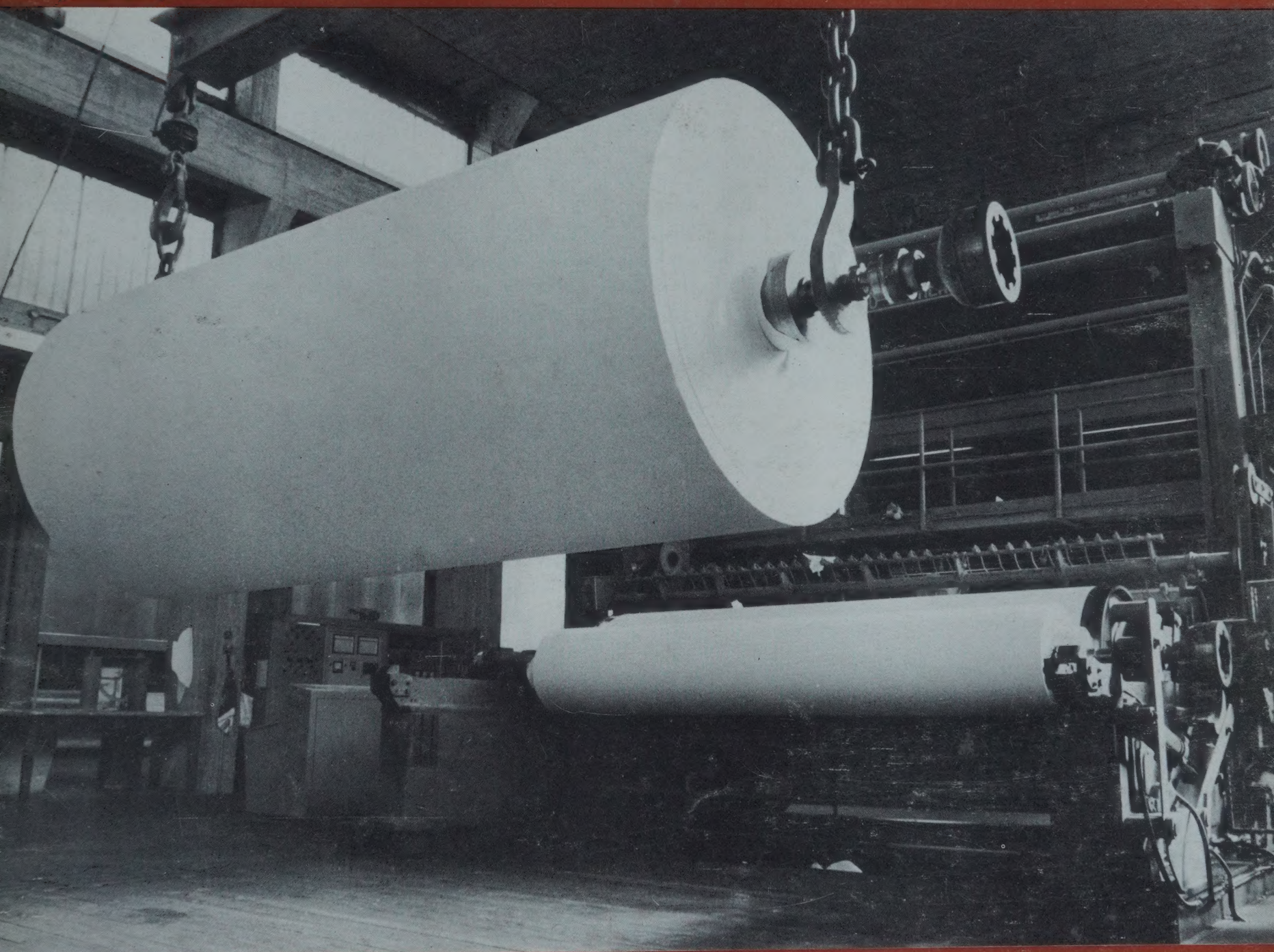

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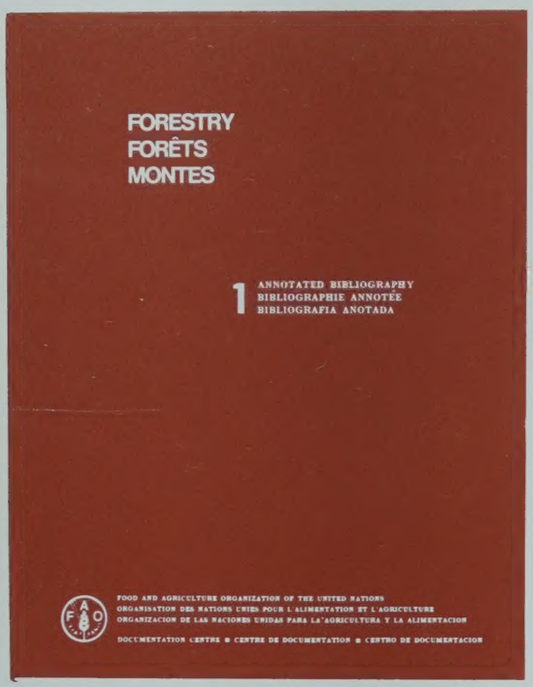

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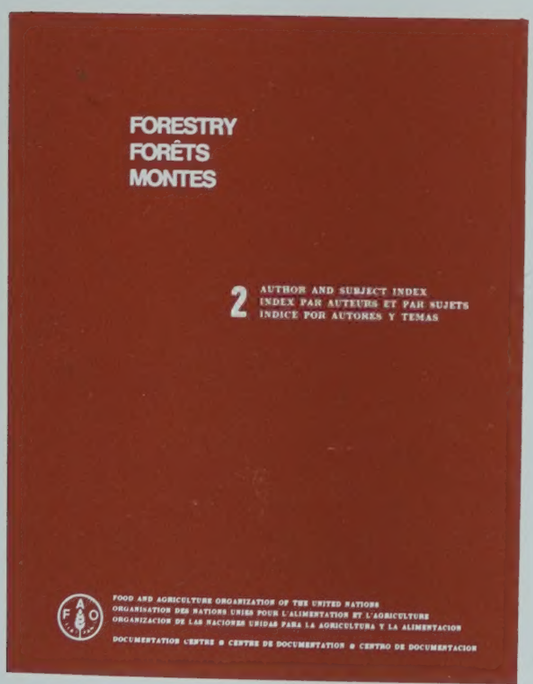

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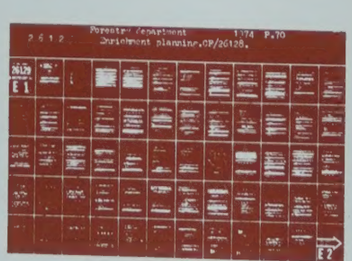

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an international journal of forestry and forest industries

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Unasylva is published quarterly in English, French and Spanish editions. Subscription price: one year, $8.00, payable to the Distribution and Sales Section, FAO, Via delle Terme di Caracalla, 00100 Rome, Italy, or to any of the FAO sales agents listed on the inside back cover.

EDITOR: T.M. PASCA

The transfer of technology

A Thai experience and the growing pains of a pulp and paper industry under foreign and home management

Amaret Sila-On

Handmade paper had been manufactured and used fairly widely for hundreds of years but modern paper-making only came to Thailand in the early part of the 20th century. A small paper mill was first established in Bangkok by the Army Mapping Corp. in 1935. Some four years later an integrated pulp and paper mill with a capacity of 10 tons/day started operations in Karnchanaburi, a province west of Bangkok where bamboo, the main raw materials grew in abundance. But the first real paper mill of commercial scale and with modern equipment and manufacturing process was first established in 1958 at Bang-pa-in, about 100 kilometres north of Bangkok and commenced operations in 1962. This, again, was an integrated pulp and paper mill based on rice straws with a productive capacity of 40 tons/day. This mill also has its own chemical manufacturing facilities. Therefore, an up-to-date paper-making technology really came to Thailand only about 15 years ago. Fortunately or unfortunately, this mill was initiated, owned and still being operated by the Royal Thai government. The project started off with a total investment of $17 million. During the past 15 years it has managed to accumulate losses totalling $8 million. Perhaps this is the real cost of acquiring modern paper-making technology during our early years.

However, we have come a long way since then: In 1962 there were six paper mills with a productive capacity of 18 000 tons per annum. Today, Thailand has 34 paper mills with annual production capacity of 330 000 tons of paper, an 18-fold increase in 15 years. Among these, the Siam Kraft Paper Company has the largest pulp and paper mill in the country and turned out some 25 percent of all paper production in Thailand or 50 percent of industrial paper output.

One of the main problems — arising time and again during the transfer of technology from enterprises in the developed to those of the developing countries — is the misunderstanding which comes from the failure to match perceptions. For example, when an entrepreneur in a developing nation plans to set up a pulp mill in his own country he may or may not understand the nature of the pulp and paper industry, and he may try to find someone who can give him composite technology on pulping. Usually, he gets in touch with a pulp and paper consultant; after lengthy discussions, feasibility studies, detailed reports, and so forth, a pulp mill is established, based on the consultant's findings and recommendations. But once the plant starts operating, the entrepreneur may find that the results do not match his expectations.

It is important, then, that expectations of the party acquiring technology should be clearly spelled out from the beginning. What exactly does this party expect? Is it a pulp mill barely good enough to satisfy indifferent requirements of a protected market? What type of manufacturing process or technology is being bought, rudimentary or sophisticated? And what type is being offered? Also, the technical consultant may have certain shortcomings, not noticeable at the initial stage when negotiations about feasibility studies are being conducted — because, frequently, technical consultants are not the people who know how to run a mill for profit. They may be able to compare various manufacturing processes and advise a client on the best choice available within the constraint of budgets, available infrastructure and general level of technical competence. But once the mill starts operations and runs into trouble, the consultants may not be in a position nor have the necessary expertise

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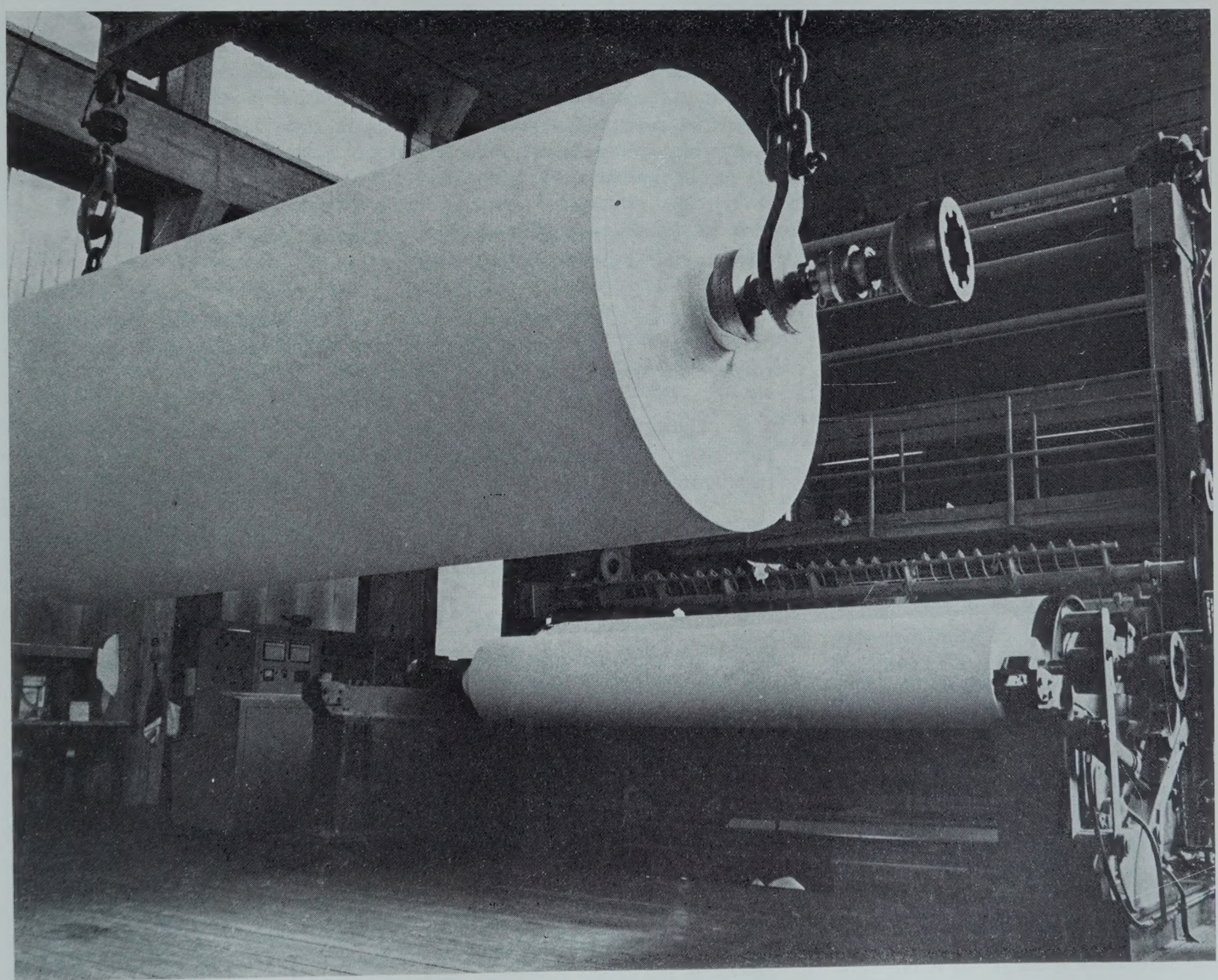
to untangle the mess, and this may lead to a lot of general unhappiness and even recriminations.

It is therefore very important that, as early as possible, attempts be made to match perceptions between the donor and the recipient of technology on what is required and what is being offered and, if possible, that terms and conditions as well as the type of technology being asked for or proposed, be spelled out in writing. As in most business transactions, particularly those requiring the two parties to work together for a long period, it is always a good policy for both sides to ensure that each gains some benefits from the transaction. In an agreement of this type, much depends on good faith and good will, and good will could be quickly dissipated if either party has a different perception on the exact nature of the object being bought and sold.

In a new manufacturing venture, success or failure may also depend on the structure of the package being offered or acquired. For example, the type of technology to be transferred: is it a manufacturing process, a special licencing agreement or is it composite technology? In most cases of transfer from enterprises in developed countries to those of developing countries, this would be composite technology or package technology. The more knowledgeable party in this deal has a moral responsibility to ensure that the structure of the package is sound and complete. The important elements in the package should be spelled out: what is the time frame, the type of know-how, the process technology, the technical assistance after installation and start-up, as well as the management services such as purchasing of spare parts and other essential materials overseas. And what compensations the party performing these services is entitled to.

Other aspects which frequently become sore points at a later stage are training of local staff, and type of foreign personnel assigned to the project in the developing countries. It is understandable that the industrial enterprises from the advanced countries would find it difficult to persuade their good people interrupt their careers in the home offices to go to work



A MODERN EUROPEAN PAPER MILL

The best partnerships are those based upon complementary expertise

and live for an extended period of time in a developing country, or perhaps the company offering technology may find it difficult to spare their good men. And this could lead to all sorts of problems. Because the not-so-good man transferred to work in a developing country may develop after a while a taste for the easy life and seemingly princely style of living available to foreigners in such a country. And although he is supposed to train local staff to take his place after a certain period of time, he may find it more convenient to forget it; indeed, he may find all sorts of excuses, consciously or unconsciously, for delaying the training of local personnel in order to postpone his departure. The good men normally set their sights at a higher position in their home country and are not likely to exhibit such behaviour. In many projects requiring relatively conventional technology and where the overseas experts are supposed to train the local staff to take over their jobs, it often happens that after five or ten years the experts claim that "the natives are not as intelligent as previously envisioned" and that "the native engineer will not be able to take over the mill within the foreseeable future" — which means that the expert must stay on for the good of the project. Meanwhile, the local staff become understandably restless and this will probably lead to a deterioration of relationship between the principals.

At this point it is also useful to stress that the enterprise with technology to offer should also pick and choose the recipient of its technology fairly carefully. Most developing countries abound with brokers, that is, the people who use their ability as contact men to buy technology from reputable companies in industralized countries, and then try to peddle it to industrial companies in the developing countries who are not so fleet-footed at contact work. In such hands, things could become very messy. So, if it is at all possible, the owner of technology should make sure that the people who buy it are the people who are going to use it, and even more important, that the people who buy the know-how are *capable* of using it. It is not very useful — but unfortunately not unheard of — to sell a nuclear power

How to transfer technology

The terms relating to acquisition and transfer of technology can be defined in various ways. Borrowing from a United Nations pamphlet published in 1973, entitled "Guidelines for the acquisition of foreign technology in developing countries," it can be stated that the concept of technology or know-how discussed here denotes the sum of knowledge, experience and skills necessary for manufacturing a product or products and establishing an enterprise for this purpose. In developing countries, technology needs to be viewed in fairly comprehensive terms covering not only the specific process or manufacturing technology but also various other types of knowledge and expertise necessary not only for setting up a plant but also in successfully operating it. This is "composite technology."

Enterprises in developing countries generally prefer to acquire composite or package technology rather than specific know-how covered by patent or trademark which is the usual form of technology transfer taking place in industrialized countries. This is because the general level of knowledge and expertise in manufacturing is usually much lower in developing countries. Therefore, the transfer of specific process or production technology must often be accompanied by technical assistance. This transaction encompasses both the establishment and operation of an industrial enterprise.

A project to establish a manufacturing enterprise in a developing country passes through several stages:

- First, a pre-investment study including the preparation of a feasibility study followed by a detailed project report.

- Second, if the project is judged to be feasible, then basic and detailed engineering design including preparation of machinery specifications, plant design and factory layout would follow.

- Third, the project owner with the help of the technical partner will have to go through equipment selection, plant construction, erection and installation of machinery and start-up of the plant.

- Fourth, the manufacturing process or technology will have to be acquired or transferred to enable the project to start working.

- Fifth, technical assistance will probably be necessary during the post-installation period, including training programmes for local personnel as well as various forms of management assistance.

The establishment of manufacturing enterprises in developing countries frequently requires foreign technological expertise at one or more of these stages. Frequently, in starting a new manufacturing industry, feasibility studies have to be undertaken by foreign consultants while the basic engineering services and even rudimentary process technology must usually be obtained from abroad. Also, at the construction stage, local expertise may suffice for the civil works but installation of plant and equipment may have to be undertaken by foreign experts. The basic infrastructure may also be lacking and this could only be built up with deliberate efforts by the public sector.

station to people who don't even know how to operate a steam engine.

Perhaps we should now look at Siam Kraft. Siam Kraft Paper is a company which has been in operation for about eight years. It has a 200-tons-a-day kraft paper and board mill at Banpong, 86 kilometres west of Bangkok. It also has a pulp mill with a capacity of 60 tons-a-day based on bagasse. The original project envisaged the manufacturing of kraft paper from mixing imported kraft pulp with locally-produced bagasse pulp and some recycled waste paper. During these eight long years, the company has been on the verge of bankruptcy three times; during the first five years, the company remained alive because it was granted an absolute monopoly on kraft paper manufacturing in the country. Toward the end of this monopoly period the government even came to its aid with a total import ban.

Many experts have gone through this mill and pronounced it to be a generally well-built plant with good equipment; and yet, the mill could not make money. During the first period, from the feasibility-studies stage to a period twelve months after start-up, Parsons & Whittemore was the managing and technical partner. During the second period of about four years a group of American technicians — mainly former W.R. Grace personnel assumed the responsibility of running the mill. Both of these groups have come to grief. The first group managed to build the mill, but the company became insolvent within a year after start-up. The second group came in after the financial re-organization and have made a lot of technical improvements including balancing of various equipment and bringing the mill up to its projected capacity. But four years later, the company again became insolvent. Many of Siam Kraft's problems had little to do with technology transfer; most of them were the result of structural weaknesses in the project itself, especially from the business viewpoint. Its financial structure was too weak and its commercial management aspects lacked firmness and direction. But still, it is also true that although the company possessed good equipment, it could not produce paper of acceptable quality to many of its customers — much less that meeting international standards. This is clearly a matter of technology; and some seven years after it had been in operation a great number of expatriate staff still had to be retained because it was felt that local people would not be able to handle the responsibility. So, in a sense, technology had not been transferred. Such was the experience that Siam Kraft, a Thai company, had with two sets of technical and commercial partners who are from probably the most technologically advanced country in the world, the United States.

At the end of 1974 when the company was on the rocks for the second time, a group of creditors, comprising several major bankers both locally and U.S.-based, persuaded Siam Cement Company, the largest industrial enterprise in the country, to take over the management function. But Siam Cement had the good sense to realize that it did not possess pulp and paper technology. The company has been in the manufacturing business for some 60 years, and had a wide and diverse experience in such manufacturing fields as cement, construction steel and other construction materials (asbestos-cement sheets, PVC pipes, concrete products, refractory bricks and so forth). But since it had no experience in the pulp and paper business, Siam Cement persuaded Honshu Paper of Japan to become its technical partner. Although a technical assistance agreement had been concluded between Honshu Paper and Siam Kraft, it is recognized in the practical sense, that this was really an "international rescue mission" mounted by a large local company which supplied the commercial and industrial management expertise together with a group of Thai and U.S. bankers, who provided the financial back-up, while the Japanese pulp and paper company contribute the necessary technical know-how. Thus began the third life of Siam Kraft Paper in November 1975.

When the present management of Siam Kraft took over the company it encountered all sorts of problems: to put it briefly, if you can think of any business problem that a pulp and paper company could face, Siam Kraft had it — from pollution problems to marketing and inventory management, from labour unrest to cash flow problems. You name it, Siam Kraft had it. On the technical side the company could certainly make paper but it could control neither quality nor costs. The manufacturing staff were capable of operating the mill but they lacked the depth of understanding necessary to uplift the general standard of performance from the mediocre to the efficient — and this is always the critical factor that makes the difference between just-getting-by and profitable operations.

The Honshu technical contract

At this point I must give a detailed account of how the new arrangement was planned.

A few months after Siam Cement took over the management of Siam Kraft, Honshu Paper, the fourth largest pulp and paper company in Japan was persuaded to conclude a technical assistance agreement with Siam Kraft under which Honshu would provide all necessary technical know-how to operate Siam Kraft's pulp and paper mill. The contract was for a period of one year and after this twelve months' trial period, Honshu agreed to enter into a longer term contract to last until the end of 1981. The terms of the contract were simple: Honshu would provide all necessary know-how and technical assistance in running the mill and would assign a number of experts to be based in Thailand, as well as a series of specialists on various facets of operations who would come in on a temporary basis when needs arose. And for this contract, Honshu was to be paid on a standard cost-reimbursement basis plus a nominal consulting fee. For the long-term contract, Honshu would also be entitled to an incentive fee which would be based on the level of Siam Kraft operating profits.

The division of labour can be clearly seen. While Honshu is responsible for providing manufacturing know-how on pulp and paper, Siam Cement takes care of all operational matters and other non-technical management, such as costing and the internal control system, personnel, legal services electronic data processing and so forth. It

is believed that such a combination does utilize each partner's respective strength to the best advantage. This Siam Cement/Honshu tandem has been at work for almost two years and so far things have gone fairly smoothly. Although both are Asian, there is a large cultural gulf between the Thai and the Japanese. This gulf is no narrower than the gap between an oriental and western culture. The cultural differences have, to a large extent, been overcome through the strong determination on both sides to make a success of this challenging venture. And, thanks to the determination of these two diverse groups of people, Siam Kraft is now well on the way to recovery. To be sure, there are many more bridges to be crossed and many obstacles ahead, especially on legal and financial aspects. But, operationally, the company can now be certified to be in a healthy state; and with time and a sensible capital improvement programme, the operations should prove to be quite profitable within the next few years.

It is true that the present management had the advantage of hindsight on those problems which brought Siam Kraft to its knees twice within the last decade. But that is a way the world achieves progress: people learn from past mistakes whether committed by themselves or by others. We have indeed learned a great deal, not only from past management mistakes, but also from our own during the last two years; and from this rich pool of experience, we hope to build a sound and viable company — a company which will provide a firm foundation for future developments of the pulp and paper industry in Thailand.

The "Big Brother Programme"

We should now ask ourselves — is there anything we could learn from Siam Kraft's bitter experience which will be useful for other developing countries in their quest for the development of their own pulp and paper industry? I believe that packages similar to those provided by Siam Cement and Honshu could be a vehicle for a relatively painless technology transfer within the pulp and paper industry. I believe that the critical factors are the matching of perceptions between the partners in the various countries as well as the dovetailing of special skills and complementary expertise. In pulp and paper, a basic and capital-intensive industry, the will to succeed is not enough; it must be matched with skills and resources from both sides of the fence.

Particularly in the developing countries, where the pulp and paper industry is still at the infant stage, it is always better to buy a composite technology rather than specialized know-how. It is also preferable for aspiring entrepreneurs or owners of industrial enterprises new to the pulp and paper field to get whenever possible technical partners who are *practitioners* in the industry, that is, pulp and paper companies rather than specialized consultants who may be very knowledgeable on certain aspects but lack the all-round ability to solve complex and inter-related problems, on a continuing basis.

And now, I would like to propose a new vehicle for technology transfer between the developed and developing countries which I would like to call the "Big Brother Programme." In solving problems of technology transfer in the pulp and paper fields I believe that the best qualified people for helping companies in the developing countries are the larger pulp and paper companies in the developed countries.

This help should be offered on a commercial basis but perhaps initially the rate to be charged for know-how could be a concessionary one, on the principle that nothing of value should come free. But in a free economy, nothing works better than good old self-interest, and therefore such a programme must also contain some elements of material advantage to be gained by the "Big Brothers," the pulp and paper companies in the developed countries. It could be international prestige, it could be the opportunities to give their own staff more diverse training opportunities and a wider base of knowledge and experience, or it could be the opportunity to secure a foothold in a hitherto inaccessible market.

Take ASEAN for example: it is a regional grouping of South East Asian countries — Indonesia, Malaysia, the Philippines, Singapore and Thailand. This is an area rich in natural resources with a population of 250 million, reasonably good infrastructure and a tradition of free enterprise. These 250 million people now consume about one and a half million tons of paper a year and will need a lot more in the near future. So, to the industrial giants in the OECD I should like to say: surely, you can spare your conventional process technology, surely, you can spare some of your good men for a few years. And therefore I would urge them to pick themselves an area in which they would like to have a "presence" in the long run and, finally, to pick their younger partners in the chosen areas.

One of the problems which delay transfer of technology between developed and developing countries is that so far the main contact points have been through government channels or international organizations. More direct contacts among the private sectors of developed and developing countries would, I am sure, significantly reduce the time lag. And, taking the long range view, it is quite conceivable that some synergistic effects will result from combining western technology and its large demand base with the developing countries' cheap labour pool and fast-growing tropical forests which could prove to be significant factors on the supply side by the end of the century.

In any case, I sincerely hope that a way could be found to make this programme, or something similar, work, because it will be in the long-term interest of both the developed and developing countries. But to our "Big Brothers" in the advanced economies, I would like to make an appeal: in effecting technology transfer or offering help and support to your counterparts in the less developed countries, please do not treat us as charity cases, do not spoonfeed us, but instead do teach us first to stand on our own feet and then to walk and even to run under our own power. And I hope you will give serious consideration to this proposal so that transfer of technology will happen in reality and with effectiveness and will not remain just a beautiful concept on paper. ■

Case history of a South American paper mill

Gustavo Gomez

Needed: partnerships of governments, private investors at home, foreign companies and international funding agencies

To discuss the outlook for investment in the pulp and paper industry, we must obviously begin with the prospects for capital availability. Clearly these prospects are not, on the surface, particularly favourable. The entire world — both developing and already developed — has entered a period of serious capital scarcity. This has inhibited the undertaking of all but the most soundly based investment projects.

In the author's view, the single most practical avenue for capital formation in developing countries in the years ahead lies in the development of pragmatic working partnerships, based on the mutual fulfillment of complementary needs and goals. These partnerships will be most effective when they are composed of several very different major entities: First, a body of private investors native to the country in which the project is to be created, whose business interests will be served by successful development of the project. Second, the government of that country either providing temporary "seed" capital or inducing a positive economic environment. Third, a substantial private sector investor from one of the more developed nations — more probably, but not necessarily a major international paper producer or a leading financial institution. And finally, one of the world-wide or regional development agencies, such as the World Bank or Inter-American Development Bank, which are quasi-governmental in nature, but function in many ways like a private investor. These partnerships can be realized either through equity or debt financing, or through various forms of investment incentive available to government bodies.

Considering the over-riding factors of inflation and capital scarcity, it would appear that prospects are not encouraging for private sector investments businessmen native to the country in which the project is to be located, especially when the local capital markets are weak — as they always seem to be. Pragmatically, one would suppose that their personal objectives would be best achieved by liquid investments in secure financial instruments at inflated rates of interest.

But investors do exist in many developing nations who have viable profit motives for investing in their own country's development. Among these are paper converters who may presently be importing their paper needs, as well as local customers for converted paper products who have a direct practical interest in the establishment of an assured permanent domestic source of supply.

For this class of investor, return on investment may be calculated not only on the basis of financial return,

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but in terms of freedom from dependence on the vagaries of the imported trade, which is frequently adjusted to suit the needs of the exporter, rather than those of the importer.

Another type of compatible investor may be found in certain financial institutions, such as insurance companies and development banks, which tend to have long-term investment objectives.

I submit that, even in an area of scarse and costly capital resources, capital investments in primary pulp and paper capacity in developing countries are possible if an assured domestic market can be projected; and a partnership can be constructed between investors with truly complementary objectives and motives, resulting in an organization with a strong financial base and a well-structured, conservative balance sheet.

I believe that the soundest and most reliable market for the justification of a capital investment is a growing domestic economy in which paper products in the form of packaging or printing and writing grades have already begun to be established as an integral part of the economy of the nation.

This scenario can be based on either of two sets of circumstances. The country may already have the beginning of a domestic paper converting industry with paper needs being supplied by costly imports. Or, there may be virtually no internal converting industry at all, with customer's needs being supplied by cost imports of finished paper products.

In the first instance, where the beginning of a converting industry exists, the project may be started with the development of a paper mill and supporting raw material base. Or, when there is no domestic industry at all, the first investment may be in converting facilities, with the mill and raw material base to follow.

However, in either case, one critically important principle is met: the project is basically oriented to a domestic market. This forms the most viable basis for starting a pulp and paper industry in a developing country. The new industry becomes an integral element in the economic structure and strengthens the organic growth of the domestic economy creating a new technological and managerial class. In the case of packaging, which my company manufactures, the new industry provides the basis for the modern system of distribution, providing the essential link between producers and consumers, and permitting the economy to expand indefinitely in scope, variety and availability of products offered in the national market place.

And, of course, a domestic industry mitigates dependence on the uncertainties of the import trade, and provides lasting social and economic benefit in terms of an increased income base and supplier businesses.

One caution; to be sound over the long term, the initial investment has to be commensurate with the market, be modest in scope and responsive to immediately foreseeable demand, but expandable to meet future needs. In this way, a significant amount of the capital required to develop the enterprise can be provided through retained earnings and depreciation. While this is the soundest means of investment, requiring the smallest amount of outside capital and offering the greatest possibilities for long-term financial soundness, it also requires investment partners whose own objectives are compatible with a low initial payout and a consistently aggressive policy of profit re-investment during the early years of the project.

> The greatest pitfall for a growing business comes when some initial success has been achieved... the temptation to move too far and too soon is often irresistible.

In 1944, the year in which Cartón de Colombia was founded, no integrated paper or paperboard packaging industry existed in Colombia. There were some small converters of bags and writing papers, and there was some rudimentary production of folding cartons using imported board. Container Corporation of America also exported some finished corrugated containers and some boxboard to Colombian manufacturers but, for the most part, Colombia was wooden-crate territory. However, the economy of the country was sound and growing and appeared to be on the verge of increasing development as soon as the energies of the world could be diverted from World War II.

At the same time, some leaders in the United States were concerned that the high levels of production of all types of industrial products generated by the war economy would result in excess capacity and might precipitate a new depression similar to that following World War I. For this reason, efforts were made to plan the movement of some capacity and associated investment capital into traditional export markets.

It was in this environment that Walter P. Paepcke, founder and Chairman of Container Corporation of America, began to investigate the possibility of establishing a cooperative packaging venture in Latin America. He found that a group of the Company's export customers in Colombia were interested in establishing a local paper industry and were seeking Container's participation. He perceived that Colombia appeared to offer an attractive future market.

Mr. Paepcke's proposal to these investors was revolutionary in those days when much of the world was still in the grip of *de facto* colonialism. He suggested an even partnership, with 50 percent of the initial capital to be provided by Container Corporation and 50 percent by Colombian investors. It its perhaps worth noting that this type of partnership is today — 34 years later — expressed as a goal by the countries of the Andean Pact. Accompanying the formal agreement was an understanding that Container would provide training in management methods, finance, and technological expertise, as it was observed that there existed abundant and capable human resources. The Colombian group would adapt these skills to the Colombian environment, and would manage

the legal, labour and social requirements of the business.

In line with the principles stated earlier, the Colombian investor group was composed in large part of local paper convertors and users, some of whom had been export customers of Container. They were extremely interested in developing an assured local supply of paper, and they brought to the partnership a sound knowledge of the local market.

For its part, the government of Colombia was highly receptive to foreign investment. There were no exchange or trade restrictions, and corporate dividends for all practical purposes were tax-free. So, while the government was not at that time an actual partner in the enterprise, it was instrumental in providing a climate conducive to private capital formation and investment in new industries of both foreign and local origin.

And, finally, in keeping with the realities of a moderate sized developing economy, the initial investment was kept small. For this reason, during the early years and even now, Cartón consistently took advantage of the availability of second-hand equipment from North America and other developed economies. At the same time, the company and its investors made sure that earnings were retained in the business to finance development. This conservative policy was possible because the interest of the partners was centred on the long-term development of a Colombian pulp and paper industry with the minimum necessary investment of new capital, and with no frills allowed.

While the decisions made in the founding and organization of Cartón de Colombia were made by managers and investors with no experience in international business, and certainly followed no preconceived plan, all of the above-specified preconditions for the success of such a venture today were present then.

First, there was an assured market for paper products in the domestic economy. It was apparent that, as the company grew, it could become a part of the Colombian economy growing with the development of the nation. A majority of the Colombian investors had personal objectives and motivations which coincided with those of the foreign investor, and were able to supply badly needed knowledge of the local market. For its part, Container was able to transfer to the Colombians the management expertise and technical knowledge which was missing in Colombia at that time. And finally, all partners were agreed that the new enterprise should begin with a modest capital investment and should finance expansion through the internal generation of funds whenever possible.

Perhaps the greatest pitfall for a growing business comes at the moment when some initial success has been achieved, and investors and managers see important new opportunities that seem almost within reach. The temptation to move too far and too soon is often irresistible, and Cartón company was no exception.

A growing industry in a developing economy must be ruthlessly realistic in the projection of market demands.

Colombia had had since 1939 one producer of multiwall bags who supplied the packaging requirements of the sugar and cement industries, using imported papers. A decade later these two customer industries were growing rapidly, and so were their needs for paper packaging. A group of Cartón's shareholders, including some who were also investors in the growing cement industry, believed strongly that the company should enter into multiwall bag production and should also build a kraft mill to produce domestic kraft papers. At this time, the Korean War was at its height, the world market for paper products was extremely tight and prices were increasing rapidly.

Cartón, meanwhile, had pursued its determined policy of retaining all earnings in the new business and its financial position was sound. Therefore, no problems were encountered in the building of a multiwall bag plant, and operations began sucessfuly in 1950. In this spirit of optimism, plans also went forward for the construction of the country's first domestic kraft paper mill. The course of this decision, however, was not to be so easy.

During the wartime economy, it was difficult to find adequate equipment for the new mill, particularly since initial projected capacity was to be quite small. However, it appeared that fortune was continuing to smile on our young enterprise, and we discovered the availability of a paper machine being made for a North American company which had encountered financial difficulties. The fact that the designed capacity of this machine was substantially above the projected requirements of the Colombian economy at that time was considered another plus in view of the current world-wide scarcity of papers. At the same time, we had — we thought — an assured customer base for the bag papers to be produced on the new machine, and we made plans to adapt the machine for the production of kraft liner and corrugating medium — following the theory of developing sound domestic markets.

However, in our enthusiasm, we overlooked some of the principles which had gained us our early success. We embarked upon a large investment which was beyond our means and could not be financed from internally generated funds, for which new capital was not available from the original investors, and which necessarily weakened our balance sheet.

We entered the project without an assured realistic domestic market, relying on unproved assumptions about our ability to expand in the domestic market beyond the original concept of the mill as a producer of bag papers — for which there was a demand. Finally, our foreign partner, Container Corporation of America, had no experience in the production of bag papers and, thus, could not offer us the expert technical assistance which had played such a large role in our early achievements. This turned out to be a critical problem.

Nevertheless, we made the investment, financing it 40 percent from internally generated funds and 60 percent with short-term bank borrowings

within Colombia. This ignored the principle that the financing for a capital investment project should, under normal circumstances, be roughly commensurate with the expected payout period of the project.

The mill was completed in late 1952, and our troubles began. Initial demand was only 12 percent of installed capacity, making efficient operation impossible. Even though we used entirely imported pulps, the quality of our paper was very low, due to lack of technical know-how, and bag rejects increased at an alarming rate.

At this time, the Korean War came to an end and so did the world-wide paper shortage. Faced with our low quality and the sudden availability of imported bag papers, the customers who had assured us of their business rapidly abandoned us for the competing bag converter, who used high quality imported papers. The move back to imported bags was accelerated by a rise in coffee prices, which increased Colombian foreign exchange reserves and made imports more viable.

During this period, as a result of our earlier optimism, we were faced with the necessity of repaying our heavy short-term borrowings while the project was losing money. We were able to survive as a company only because of the soundness of our original human and financial structure, which allowed us to pour all of the energies and earnings of our other operations into the support of our kraft mill for a period of at least four years. This is an option which may well not be available to future enterprises in developing nations, and it certainly curbed our growth during the middle years of the 1950s.

Our efforts to enlist government aid to raise import tariffs as an effective protection against foreign papers were unsucessful and we were caught in a drastic price competition in order to increase sales volume of the mill. During this period we were also working intensively to solve our technical problems, but the mill did not become truly operational until 1956, when a new foreign-exchange crisis forced the Colombian government to prohibit imports.

In the long run our initial optimism about this project was justified, and today bag papers and multi-wall bags are one of our most profitable lines of business. Colombia today needs these bags, and most of the country's agricultural supplies move in these versatile containers. However, it must be admitted that we were simply very lucky. The chance that the mistakes we made in incorrect evaluation of this project would destroy our enterprise was great, and even the rewards that were eventually gained do not justify the risks of the mid-1950s.

Cartón de Colombia, S.A.

Cali
President: Gustavo GOMEZ
Mill manager: Gabriel Vasquez
Technical director:
Gustavo Calle
Pulp mill manager:
Victor Giraldo

PAPER

Cylinder: 210 cm & 215 cm
Fourdriniers: two 395 cm

MAJOR PULP MACHINERY

Six batch-type digesters, one continuous digester

PRODUCTS

Bag paper; Corrugating medium; Enamelled; Folding boxboard; Kraft linerboard; Kraft - unglazed, unbleached; Semi-chemical (N.S.S.C.) pulp; Sulphate unbleached pulp

ANNUAL PRODUCTION

Paper and paperboard:
173 000 tons
Pulp: 95 000 tons

In short, the point I wish to leave with you here is that a growing industry in a developing economy must be ruthlessly realistic in the projection of market demands. If a really valid sensitivity analysis is made of an impending investment, it will indicate that the worst possible outcome will very likely become future reality.

Assumptions must be based on a tough-minded evaluation of long-term market developments. Proper technological and marketing expertise must be assured before entering into the market — particularly if the product must compete to some extent against imports from more developed countries. Furthermore, a clear understanding of the long-term financial climate of the project is indispensable. Even if the project is internally profitable, this may be negated by unattractive financial terms, as happened to us when 60 percent of the investment came due within one year.

Although they may appear simplistic at first glance, I believe it is clear that this review of our mistakes serves to demonstrate the validity of some of the conclusions on capital investment discussed earlier in this report.

During the late 1950s we had another nearly disastrous experience. It demonstrated the need to select partners for a capital development project with a view of the long-term compatibility of their investment objectives with those of the project itself.

The majority of our Colombian investors were customers for the products of Cartón, and they were in full agreement with our decision to retain all earnings in the business in order to finance growth. Their primary interest was not in immediate financial return, but in the development of a sound paperboard packaging industry as a vital part of the Colombian economy. Clearly these are the kind of partners needed for the success of the type of capital investment in the paper industry under discussion here.

However, some 15 percent of our original investors had no connection with our business and were motivated largely by the normal desire for an early return. Reacting to pressure from this group, a small dividend was declared some years after the company was organized, but it was clear that the financial policy of the company would continue to be oriented toward growth and the dissident investors decided to sell their shares. It was impossible however to find new Colombian investors who shared our conservative attitude toward profit reinvestment. At this point we were very fortunate that our foreign partner, Container Corporation, and some related shareholders, were willing to buy back these

INSTRUCTIONS TO SUPPLIERS OF THE PULPAPEL MILL

Warning: some wood may be rejected at the gate

shares, with the result that ownership of the company is today 34 percent Colombian and 66 percent foreign.

It is unlikely, however, that a new enterprise could depend on such support from one of its partners in the future. It is most probable that such a divergence of interests among the partners would have serious consequences for the enterprises.

Since inadequate and imperfect capital markets in developing countries make it difficult to depend on substantial equity investments from local investors, it may become necessary to consider the government as a potential partner in the planned capital project, particularly during the initial stages of development.

Governments frequently have social motivations for investment participation and this can make them desirable and complementary investment partners. We have had direct experience

with the government as a partner in a major investment and we owe a great deal of our present strength as an independent company to this partnership.

As with pulp and paper enterprises in most developing countries, one of our chief problems in the building of a fully integrated operation was the lack of an adequate domestic fibre supply. Tropical hardwoods, with which our country abounds, had never been pulped in commercial quantities. In part, this was because hundreds of different species grow side by side in the mixed rain forest. Furthermore, there were no available long fibre species native to the country.

The Colombian Industrial Development Institute had been discussing with Cartón since 1953 the possibility of entering into a joint venture in the Magdalena area of Colombia in an effort to find productive uses for the nation's substantial unused forest resources. We formed a joint venture between Cartón, Container Corporation of America and the Industrial Development Institute, and feasibility studies were begun.

By 1959 these studies were completed, calling for an investment of $20 million, and technical research and development had progressed to the point where three old rotary digesters at Cali were producing 1 500 tons per month of pulp from mixed tropical hardwoods.

However, since we had just recently recovered from our nearly disastrous experience with a too-hasty investment in our kraft mill, we took the time to re-evaluate this new project. This, combined with some lingering doubts about the availability of appropriate human resources as well as about the market assumptions of the project, caused us to terminate our involvement in Magdalena, at that time.

But our interest and that of the government in the pulping of tropical hardwoods did not diminish. We promptly embarked on a somewhat less ambitious pulping project next door to our existing mills in Cali, utilizing fibres from the adjacent rain forests of the Pacific watershed. In this new project, higher wood costs were more than offset by the lower capital investment required, by the existence of an adequate infrastructure, and by the government's recently instituted ten-year tax exemption for newly created basic industries.

"Pulpapel" was created in 1960 as an equal partnership between the Industrial Development Institute, Container Corporation and Cartón de Colombia. Over the past decade and a half, this organization has pioneered in the development of the technology needed for the pulping of mixed tropical hardwoods. While these fibres cannot match the quality of long fibres from softwoods, we have been able to develop a homogeneous pulp which is usable in the production of packaging grades of paperboard. The government's objectives and ours have also been realized in the development of an indigenous fibre resource base through the utilization of native hardwoods.

Following the normal practice of the Institute, once the success of the enterprise was assured, its shares of Pulpapel, as well as those of Container, were purchased by Cartón.

Having achieved its objective and created a lasting social benefit for the nation, the government was thus able to redeploy these investment funds into other new industries which could benefit from a partnership with the government.

For our part, it is unlikely that we would have been able to consider such an initially risky investment had it not been for the partnership and support of the Colombian government.

While this last example demonstrates the desirability of government partnerships in terms of initial equity investments in a project, governments also have the ability to participate actively in developing an industry by means of various methods of indirect and perhaps intangible investment. This type of "partnership" is well illustrated by another of our investments in Colombia.

Banana exports have long been an important factor in Colombia's export trade, but traditional methods of shipment without packaging were wasteful. Packaging of export bananas in corrugated boxes had been experimented with and found to produce great savings in terms of the increased percentage of better quality fruit delivered to foreign markets. In 1969 Cartón built a corrugated container plant in Turbo, in the heart of the banana growing region and this plant has contributed significantly to the increased sale of Colombian bananas in world markets.

The decision to build this plant was heavily influenced by the actions of the government, which instituted favourable tax incentives in order to promote the country's export business. When the project was begun, the tax benefit consisted of a credit against income taxes amounting to 40 percent of exported value.

By offering this incentive, which greatly reduced our risk in the new investment, the government (although its investment was indirect) became in effect a partner in the venture.

Soon after the Turbo plant was completed, government policy shifted and the tax incentive was reduced to 15 percent — still welcome, but an incentive of a different order of magnitude.

Closely associated with the decision to build the corrugated container plant at Turbo was our plan to construct a fifth paperboard mill at Barranquilla on the north coast. This mill was intended to supply paperboard for the banana-export boxes, as well at to an existing container plant at Barranquilla.

Even though the government subsidy had already been reduced before construction could be started, the remaining tax incentives plus the projections of market demand and the fact that the production of this mill would

Governments frequently have social motivations for investment participation, and this can make them desirable and complementary investment partners.

reduce dependence on imported papers, provided sufficient justification to carry out the project.

Despite their action in lowering tax incentives, the Colombian government still wished to encourage the building of the new mill, and was instrumental in helping us to obtain a substantial long-term loan from domestic and international financial sources at favourable interest rates.

While this is not the proper place for a detailed discussion of Mill Number Five, it may be worth pointing out that it does provide a good example of the type of mill that may be well suited to developing countries. In building it we adapted the latest technology from all parts of the world, including a specially designed Japanese Ultraformer. One result has been that this relatively small mill delivers a high degree of efficiency at a low overall investment.

Mill Number Five was completed late in 1975, based on assumptions which included export tax incentives. However, the mill was built basically with the objective of supplying the local market, which was fortunate, since the government virtually eliminated paper-export incentives soon after mill started operation.

It must be made clear here that the author fully understands that government policies, which must be closely responsible to changing social and political realities, are at least as unstable as are the vagaries of the market for private business.

Governments can be effective investment "partners" through their inducement of investment through incentives. However, our experience suggests that it is healthy either to have some initial direct equity participation as well, or to obtain truly realistic guarantees from the government that the effects of the incentives will be continued for a definite period of time. The tax exemption enjoyed by Pulpapel during the first 10 years of its life represented such a guarantee.

> It is the social and economic benefits — the human side of the equation — that are the real purpose of a capital investment project in a developing nation.

> We have also helped to develop human resources. Nearly all of our senior management and all of our technicians are Colombians — and the workers of the company are truly its most important partners.

Recently, in the development of Cartón, we have come to the threshold of yet another decision, one which probably will face any new capital project in the developing world. It is a dilemma caused by the desire of many developing nations to limit foreign investment-participation to less than 50 percent. In our case, the problem is whether or not our foreign partner is willing to reduce its participation. In the case of new foreign investment this limitation may make it very difficult to raise sufficient capital from local investors motivated by the kind of long-term investment that is required by the pulp and paper industry.

This concept of proportionality adds an additional constraint which might make it impossible to obtain local partners in certain countries. In addition, I have serious reservations that capital proportionality will render the results those governments are seeking.

President Alfonso Lopez of Colombia shares this scepticism about making proportionality of capital a matter of national principle. "Can you really call a company Colombian," he says, "simply because it was formed with Colombian capital and sells, say, watches here, but assembles the watches with movements it has to import from Switzerland? And," he continues, "can you really call foreign a company which has more than 50 percent of its capital in the hands of foreigners, but which is reforesting vast regions of Colombia, converting the wood to pulp and the pulp to paper, and which supplies a packaging industry and gives employment to Colombian farmers workers, technicians and managers?"

We have built a large and viable industry in a nation that badly needed that industry. The partners who provided us with the initial capital have received a handsome return on their investments, and they have also realized the business objectives which attracted them to the partnership in the first place, things that are very meaningful in a business sense. It is also true that because of the packaging products we have made available to our national economy, Colombian industry and commerce have been able to grow to an extent that was only a dream when Cartón was founded. It is as good or better in quality than that of any other developing nation, and has made possible a significant expansion of Colombian exports. In fact, today fully one-half of all the country's exports are "non-traditional" — exports made possible in part by Cartón de Colombia.

We have also helped to develop human resources. Nearly all of our senior management and all of our technicians are Colombians and the workers of Cartón are truly its most important partners.

I confess that it gives me enormous pride to realize that because the partners who organized Cartón de Colombia achieved some success in the prudent management of a capital investment, my country and its people have received substantial social and economic benefits. It is these social and economic benefits — the human side of the equation, if you will — that are the real purpose of a capital investment project in a developing nation. ■

Harvesting mixed tropical timber for paper

Torsten Frisk

Pulpapel S.A. is located just outside of Cali, Colombia and is a subsidiary of the country's fifth largest company, Cartón de Colombia. In addition to its importance to the country as a manufacturer of paper and paperboard for the packaging of agricultural products, Cartón is significant in the world of pulp and paper as a pioneer in the use of tropical hardwoods for making pulp. It is one of the few companies in the world that is doing this on a regular commercial basis. Its products consist of liner board, corrugating medium and sack paper, all made from sulphate pulp. In most of its paper and board grades about 30 percent long fiber is added to the furnish, coming from either pulp or wastepaper. The long-fibre virgin pulp costs approximately US$500/t in Cali (the rate of exchange used here is 1 dollar = 32 pesos).

As the actual demand is growing at a compound interest rate of 7-9 percent, production will have to be doubled in a period of 10 years.

To avoid dependency on foreign pulp, a reforestation programme has been implemented which will yield in the future a sufficient quantity of long fibre pulp. It is estimated that by 1983 the needs will be around 60 000 t/year.

The reforestation programme to cover this figure is 1 750 ha/year. The principal species are *Cupressus lusitanica, Pinus oocarpa, Pinus patula* and *Pinus kesiya.* The plantation density is 1 600 trees/ha. One thinning is planned at 6-8 years. Since 1974 800 ha/year of eucalypts are being planted and three nurseries attend to the planting needs with a total production of 11 million plants per year. As a promotion measure, plants are sold at 0.5 peso per plant, which is half the production cost.

In Carton's operation the first stage — logging — is obviously very important and it is the role of Pulpapel to carry this out.

This article is a forest engineer's technical report of how one company goes about harvesting the jungle for pulp wood.

The supply delivered by Pulpapel S.A. is approximately 280 000 t (400 000 m^3) debarked wood per year. Thirty percent of this volume comes from the concession of Bajo Calima and the rest from 300 suppliers grouped in three categories:

- Contractors or peasant communities with permits from the State to harvest forest areas.
- Private landowners who clear the forests for agriculture.
- Private landowners who clear the forest for reforestation purposes.

The duration of the round trip over the average distance of 165 km including loading is 4-5 days. The water

TORSTEN FRISK is an FAO logging specialist with extensive experience in Latin America.

transport is in relation to the tides, which can fluctuate up to 6 m one to three times per year.

The dimensions and characteristics of the wood supplied to the industry is as follows:

The wood is debarked. The maximum diameter is 40 cm, the minimum 10 cm. Logs over 40 cm are split in the forest. The length is 1.50 m minimum 1.20 and maximum 2.00 m. Latex and silica cause processing problems, so species with a high content are avoided. High density species are also avoided. Palm trees are not harvested. Logs with a high proportion of rot and with a middle curvature of over 35 cm are left in the forest.

The Company uses the stere as a volume measure, but the dimensions are 1 m × 1 m × 1.50 m long.

The conversion factor of volume/weight used is:

> 1 m^3 solid, debarked, air dry one month = 0.7 t.

The conversion factor weight wood/weight pulp is:

> 3 t wood = 1 t pulp; or 4,3 m^3 wood = 1 t pulp.

The Bajo Calima concession

The concession of Bajo Calima comes under the jurisdiction of the Municipality of Buenaventura, Department Del Valle. It covers an extension of approximately 54 000 ha, of which 26 000 ha are considered commercial. The concession rights cover a period of 30 years, according to the contract signed between the Company and the Instituto de Recursos Naturales Renovables (INDERENA); an excerpt from the contract can be found at the end of this article.

Here are the main points of the contract:

- Before the concession was made official, the Company had to prepare a Management Plan for approval by INDERENA.

- Some areas were reserved for colonization and small landholders.

- The authorized yearly extraction was fixed at 84 000 t/year (120 000 m^3).

- A reforestation rate that at the end of the period would generate an equal or superior volume than that extracted was indicated. Reforestation could be done in another area of tropical forest under certain circumstances.

- Two payments were fixed per cubic metre extracted, to be paid to INDERENA. The first covers the national participation and the second is for control and forest conservation services provided by INDERENA. The national participation is 5 percent of the value of the harvested timber. This value is 70 p/m^3 ($2.19/$m^3$) when the wood is destined for pulp. The national participation is therefore 3.5 p/m^3 ($0.11/$m^3$). Control and forest services amount to 10 p/m^3 ($0.31/$m^3$).

The forest administration agrees on the forest concession system, as it permits them to exercise more control over harvesting. This is also convenient for the Company because it guarantees part of the wood supply, and depending on the period of the concession also permits larger investments in infrastructure. A short concession will favour the take-and-leave attitude, with no infrastructure.

The concession is situated in a very favourable location as its boundary runs along the Cali-Buenaventura highway. The distance from the entrance to the concession to Cali is 102 km, and to Pulpapel S.A., 120 km; from the entrance to the nearest logging tract is 14 km. This location, plus the excellent interior road network built by the Company, permits a continuous flow of wood from the concession to the industry.

The distance from Cali to Buenaventura is 126 km. The road is paved, in good condition, but with many curves; the topography is difficult and it crosses a mountain ridge. The side slopes have not been stabilized and after heavy rain landslides are common. From Cali the road zig-zags up to 2 080 m over a distance of 18 km. These factors determine that a normal vehicle takes 2.5 h and a truck 5 h to reach the concession.

The topography of the concession corresponds to low hills with slopes ranging from 0 to 30 percent. The soil contains a high proportion of clay and therefore has bad drainage. Organic material is low. The annual rainfall ranges from 6 500 to 7 500 mm. The concession is at a height of 150-200 m above sea level.

By law, 200 m on each side of the roads, and 500 m at riverside are open to colonization.

This has originated the establishment of small farmers who practise shifting cultivation, although only to a small extent because the soil fertility is extremely low. This last fact has held back massive colonization in the concession. A subsistence activity consists in cutting the regrowth of the forest after 2-3 years and using the wood for construction poles. This practice certainly leads to the impoverishment of the forests, but it does allow small amounts of cash flow. The poles are sold at the roadside, at 5 or 7 pesos each, according to size. The system could be improved by choosing the most appropriate species and following a simple management plan. Pit sawing is also practiced with the larger trees.

Forest characteristics: The forest is mixed tropical, homogeneous-heterogeneous, and composed of 180 species. Out of this number, 160 species are used for pulp. The average total volume per ha is 159 m^3 with bark. The utilized volume is 105 m^3/ha with bark. The average volume per tree is 0.33 m^3. After harvesting the forest, the area can be reforested without great difficulty. The average diameter at breast height (DBH) is 30 cm with bark.

Infrastructure: thanks to the long duration of the concession — 30 years — there are good prospects of building up a permanent infrastructure.

Roads: The roadnet is well distributed and of good quality, allowing traffic on a year-round basis, even with smaller vehicles with which one can reach all the logging sites.

Road construction and maintenance is done by two different contractors: Calderón y Cía (Road construction) and Agustín Barona (Road maintenance and transport of wood).

Roads actually in service total 76 km, of which 48 km are main roads and 28 km secondary.

As an example for road density calculation, in one unit of 750 ha there

are 5 km of roads. The density would then be:

$$D = \frac{5\,000}{750} = 6.7 \text{ m/ha}$$

The road specifications are as follows:

Specification	Main road	Secondary road
Right-of-way	8-9 m	6
Width of the road	6 m	4
Maximum grade	6.5%	8
Minimum radius	50 m	40
Lay-by	150 m	150
Thickness of gravel (m)	0.20-0.60 m	0.20
Base	Corduroy	Corduroy

The roads are laid out on the ridges, avoiding the side slopes. This position improves lateral drainage and keeps earth movement to a minimum. Places where bridges or big culverts would have to be placed are avoided. The layout of the roads is done by the Company.

Planning and construction of the road network is carried out in the following stages:

- Exploration: It consists in determining if the volume of wood justifies the construction of a road. An estimate of the construction cost is made. At this stage there is close collaboration between the topographer and the forester.

- Route selection: According to the topography, situation of the forest and existing road network.

- Preliminary layout: With compass and Abney level. The distance is estimated.

- Definite layout: With compass, measuring-tape and Abney level. Calculations of earth movement are made.

- Construction: The construction is done in three stages:

1. Clearing with buldozer.
2. Earth movement with Caterpillar D4, 75hp, or Fiat C100, 80hp. Heavier equipment is not recommended as the bearing capacity of the soil is very low. On the other hand, earth movement is kept to a minimum. In both cases the bulldozers are provided with 34-in-wide tracks. In cases where the road has to be laid out on mid-slope, the width is cut into the slope.
3. Sub-base and base. The sub-base is formed by two layers of logs. The first one is placed lengthwise and the second crosswise to the axle of the road. The corduroy is necessary due to the very low bearing capacity of the soil, which lies around 0.2 kg/cm^2. The corduroy permits a better distribution of the pressure on the soil and prevents the gravel sinking. The average diameter of the logs is 10 cm.

On one kilometer of main road the volume of wood used for the corduroy is 750 m^3 with a space factor of 0.8 2(0.0078 × 60 000 × 0.8) = 750 m^3. If we consider the road density of 6.7 m/ha, the volume of wood used for the corduroy amounts to 5 m^3/ha. A 20 cm-layer of gravel is distributed over the corduroy. This layer reaches 60 cm after successive gravellings. The gravel is spread either with a motorgrader or by hand. The average distance of gravel transport is 18 km.

Equipment specifications and costs

IWATE FUJI Yarder

Approximate price	US$30 000
Model	Y-28 EG
No. of drums	3
Transmission	Sliding gear type with 4 forward and 4 reverse speeds
Drum brake	Expanding shoe-type, hydraulic
Drum capacity	1 350 m 8 mm wire rope 850 m 10 mm wire rope 590 m 12 mm wire rope
Engine	Mitsui-Deutz F3L — 912, diesel, 44 hp at 2 500 r.p.m. 4 cylinders
Weight	1 775 kg

BOMBARDIER Muskeg Tractor — JIMMY Skidder

Approximate price	US$30 000
Ground clearance	35 cm
Shipping weight	4 800 kg
Maximum speed	20 km/h
Turning radius	3.6 m
Ground pressure	2.19 p.s.i. (0.15 kg/cm^2)
Gradeability	Sidehill 25% Uphill/downhill 60%
Engine	Make, Detroit Diesel model GM 4.53, 4 cylinders, 130 hp.
Winch	Germatic model 9, with 10 000 lbs line pull, 157 ft 1/2" cable drum capacity
Tracks	Rubber belts with steel crosslinks, 70 cm wide, 2,18 m long
Payload	5 t

BOMBARDIER B-15 Transporter

Approximate price	US$60 000
Ground clearance	48 cm
Shipping weight	17 000 kg
Maximum speed	24 kmh
Turning radius	3.0 m
Ground pressure	1.95 p.s.i. (0.14 kg/cm^2) at 0 penetration
Gradeability	Sidehill 65%; Uphill/downhill 75%
Engine	G.M. 6V-53 diesel, 195 hp
Tracks	Rubber belts with steel crosslinks, 1.0 m wide
Payload	10 t

TABLE 1. **Output for the preparation of logs in both cable and manual extraction**

Operation	Cable extraction	Manual extraction
Felling	yes	yes
Debranching	yes	yes
Bunching	yes	yes
Debarking	yes	yes
Splitting	yes — diameters over 40 cm	yes - idem
Piling	cable line	roadside
Output	3.2 Company steres [1] man/day	1.0 idem
	3.1 m^3 solid without bark [2] man/day	1.0 idem

[1] 1 m × 1 m × 1.50 piled volume.
[2] Using a space factor of 0.65.

The dump trucks used are mainly Dodge D-600 with a 6 t capacity. Transport of gravel is done by contractors who are subsidized by the Company for the purchase of trucks. The trucks are loaded by a crawler shovel with a capacity of 1 m^3.

The existence of gravel and the short transport distances are perhaps the most important factors in the opening-up of tropical forests, and gives this particular concession a great advantage.

Wooden bridges are built on piles driven into the ground with a falling hammer. The wood used comes from mangrove forest and has bearing and rot-resistance. The 28 cm-diameter culverts are made of cement and are usually 8 m long. The average is 16 culverts per km.

Where landslides occur, lateral piles are placed to retain a new fill.

Output of road construction: Road construction advances 1 km per month on a 10 hour/day effective working time. The average output of the 75 hp bulldozer is 16 m^3/h. Six metres of corduroy are laid out by one man/day, working 8 effective hours per day.

Costs of road construction:

Main road: 750 000 p/km ($23 500/km)

Secondary road: 580 000 p/km ($18 000/km)

This means more or less 4 480 p/ha ($140/ha), or 43 p/$m^3$ (US$1.34/$m^3$).

Some partial costs of road construction are as follows:

Clearing	18.50 p/m ($0.58/m)
Earth moving in cut	18.50 p/m^3 ($0.58/$m^3$)
Earth moving in filling	9.25 p/m^3 ($0.29/$m^3$)
Corduroy	39.50 p/m ($1.23/m)
Transport of gravel 18 km	131.00 p/m^3 ($4.00/$m^3$)
Manual spreading of gravel	4.60 p/m ($0.14/m)
Spreading of gravel with motorgrader	16.50 p/m ($0.51/m)
Formation with motorgrader	11.60 p/m ($0.36/m)
Culverts	167.00 p/m ($5.22/m)
Side ditches	5.80 p/m ($0.18/m)
Bridge piling, labour	800.00 p/m ($25.00/m)
Mango wood	1 280.00 p/m ($40.00/m)

Road maintenance costs per month amount to 190 000 p ($6 000), or 32 000 p/km/year ($1 000/km/year). This value is equal to the normal 5 percent of the construction cost. The maintenance cost per cubic metre would amount to $0.06.

Camps: There are three camps in the concession, one for the Company personnel and the other two belong to the contractors. These have maintenance workshops for heavy equipment. Electricity is produced in each case by diesel generating sets.

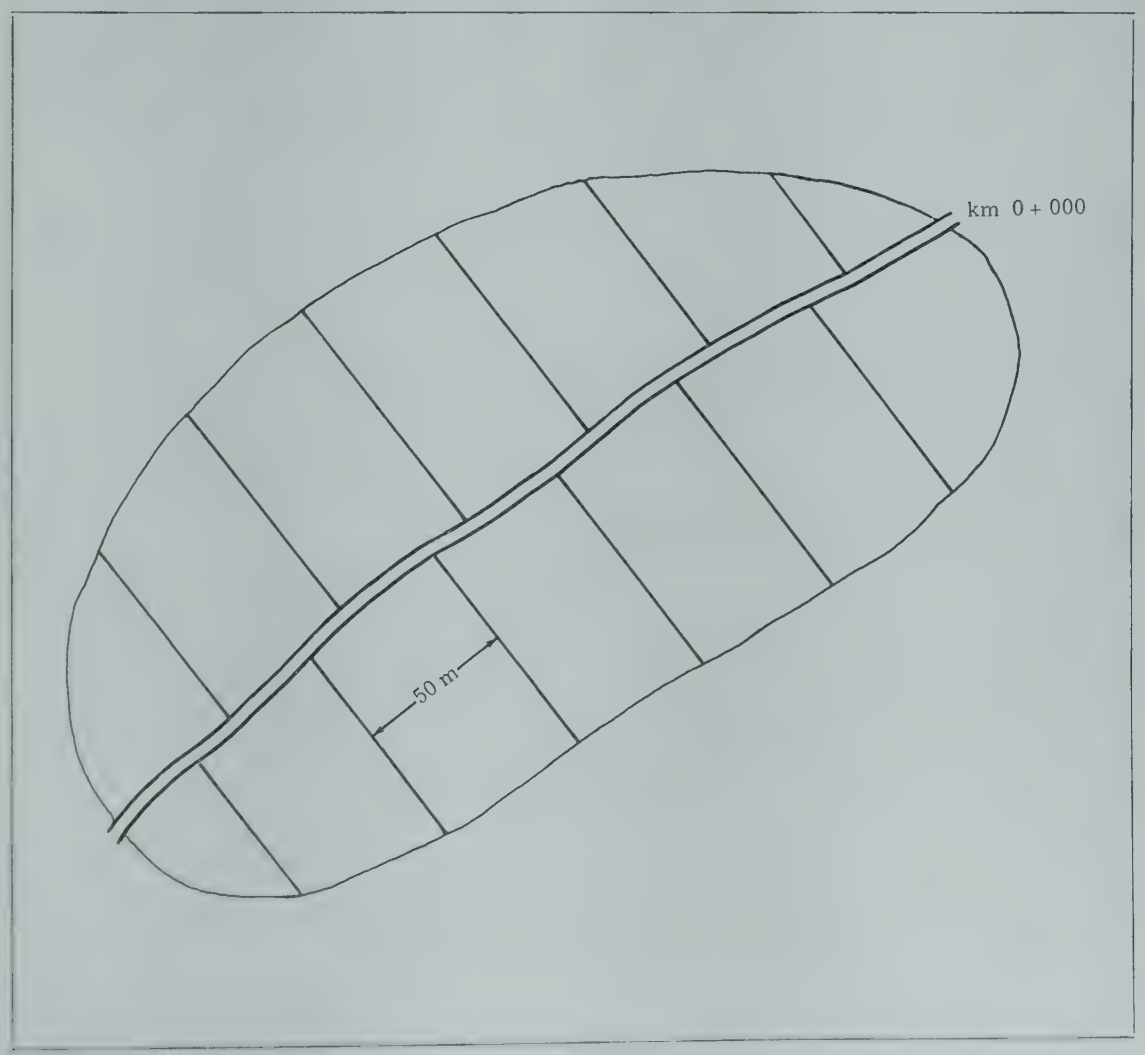


Figure 1. — A logging unit, showing parallel lines set perpendicularly to the road.

Harvesting

Two contractors are in charge of harvesting operations in the concession of Bajo Calima: Aprovechamientos Forestales Ltda. and Maderas Tropicales. Each contractor supplies 3 500 t of wood per month (42 000 t/year). Harvesting operations continue through all working days of the year, i.e. 240 days. Work continues during rainy spells and this is necessary because of the heavy rainfall. The effective working time per day is 6 hours.

The different operations are well organized and it can be seen that there is a lot of experience in working with cable systems. The folling operations can be distinguished:

- Preparation of logs: Felling with axe. Branching with axe. Bucking with chainsaw. Debarking with machete or axe. Splitting with wedge and hammer.

PULPAPEL S.A. PRE-HARVESTING FORM Unit:	Date: Line: Azimut: Longitude: Crew: Responsible:	Line 1 2 3	Site 4 5	Infl. 6	
Tree No. 7 8	Common nome of species:	Code 9 10 11	Diameter m 12 13 14	Commercial height m 15 16 17	Observations

- Skidding: Manual. Cable systems.

- Transport: With dump or platform trucks.

Appraisal of resources: Before the harvesting of the forest, and as a prerequisite stated by INDERENA, an inventory has to be carried out in the unit that will be harvested during the coming two years. The design of the inventory has been established by INDERENA.

The inventory is carried out on lines, which are separated by 50 m and projected from the road laid out by the topographer (Figure 1).

The unit is designed so that the road passes more or less through its centre. Of the total number of lines which are stratified in the unit, 10 percent are chosen at random. A base camp is located at a strategic point in the unit and the inventory crews are formed. Each crew is composed of 4 people. Every 50 m on the chosen lines a reference stake is placed, corresponding to the number of the site. Up to 20 stakes are placed, to a maximum penetration of 1 000 m.

Once the line has been staked the crew returns to the starting point and begins to advance on the line, measuring diameters and commercial heights on a strip of 5 m toward each side of the inventory line. The d.b.h. is measured with a caliper, averaging two measurements. The commercial height is estimated. The advance is approximately 1 km per day.

For the calculation of volume a local volume table designed by the Company is used. The heading of the form used in the field is shown below.

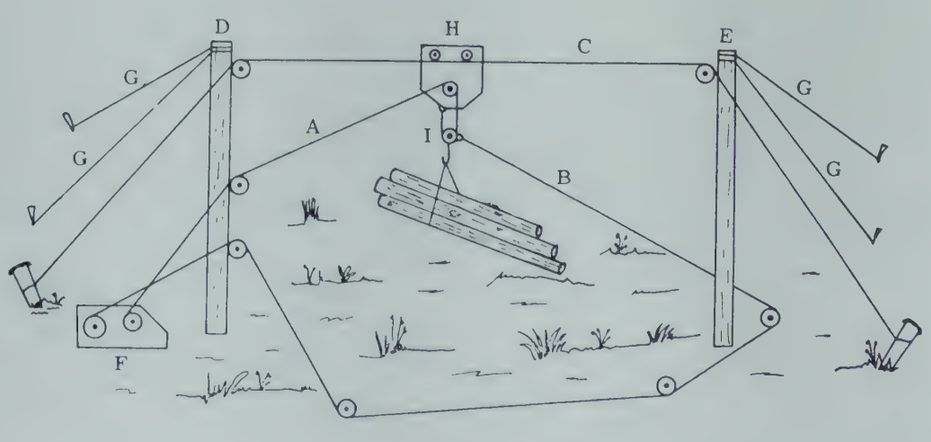
INDERENA revises the inventory in the field. A difference greater than $\pm$ 20 percent is not accepted. The revision is by basal area, and some commercial heights are compared with the forms of the Company.

Preparations of logs: The organization of this operation consists in giving 1 400 m of road to 7 crew chiefs. This stretch, penetrating 300 m on each side of the road, has to be ready in 4 months. Each crew consists of 7 workers for cable extraction and 9 workers for manual extraction.

The chainsaw operator moves from one labourer to another crosscutting the trees. The other operations are done independently. Felling and debranching are done with a 4-pound axe. Crosscutting is done by chainsaw. One of the main reasons why the chainsaw is not used for felling is due to lack of vocational training. The average operating time of the chainsaw is 4 hours/day. The Homelite XL-925 (82 cm^2) with a 65-cm blade is the most common make and it is considered to give satisfactory results.

After crosscutting the logs are debarked with a machete or an axe. Seasons have no influence on debarking, but there are differences between species. After debarking, the logs of over 40 cm diameter are split with wedge and hammer and piled either along lines where the cable system will operate or at the roadside (see Table 1).

A worker earns 23 p/m^3 ($0.72/$m^3$) for cable extraction and 70 p/m^3 ($2.19/$m^3$) for manual extraction over an average distance of 150 m. A chainsaw operator earns 10 p/m^3 ($0.31/$m^3$) on the basis of the total production. An amount of 50 percent is



A = Main line ; B = Haulback line ; C = Skyline ; D = Head spar ; E = Tail spar
F = Winch ; G = Guyline ; H = Carriage ; I = Fall block

Figure 2. — Modified North Bend system.

TABLE 2. **Operation time and output of the Modified North Bend system**

Distance	Total time	Output	Corrected output
m	minutes	m³/hr	m³/hr
100	3.83	13.82	10.00
200	4.61	11.06	8.30
300	5.39	9.46	7.10
400	6.17	8,27	6.20
500	6.95	7.34	5.50
600	7.73	6.60	4.95
700	8.51	6.00	4.49
800	9.29	5.50	4.12
900	10.07	5.06	3.80
1 000	10.85	4.70	3.52

TABLE 3. **Operating time and output of the Iwate Fuji skyline system**

Distance	Total time	Output	Corrected output
m	minutes	m³/hr	m³/hr
100	5.33	12.72	9.54
200	6.08	11.15	8.36
300	6.83	9.93	7.45
400	7.58	8.94	6.71
500	8.33	8.14	6.10
600	9.08	7.47	5.60
700	9.83	6.90	5.17
800	10.58	6.41	4.81
900	11.33	5.98	4.49
1 000	12.08	5.61	4.21

TABLE 4. **Operating time and output of the Jimmy Skidder**

Distance	Total time	Output	Corrected output
m	minutes	m³/hr	m³/hr
100	19.97	7.51	5.63
200	26.37	5.69	4.27
300	32.77	4.58	3.43
400	39.17	3.83	2.87
500	45.57	3.29	2.47
600	57.97	2.89	2.17
700	58.37	2.57	1.93
800	64.77	2.32	1.74
900	71.17	2.11	1.58
1 000	77.57	1.93	1.45

legally foreseen for social laws, but the company covers an extra 10 percent for workers' benefits.

Extraction of wood to roadside. Two methods are used for the extraction of wood to the roadside: manual extraction over an average distance of 150 m, and mechanical extraction with cable. The manual extraction was analysed in the previous paragraph as it is part of the felling and related operations for payment purposes.

Two cable systems are used: the Modified North Bend system and a skyline cable system. They are operated either separately or combined.

Modified North Bend system: This system has been used for some years by the Company and the personnel has acquired much experience. It has now become a traditional system. The main parts of the system are shown in Figure 2.

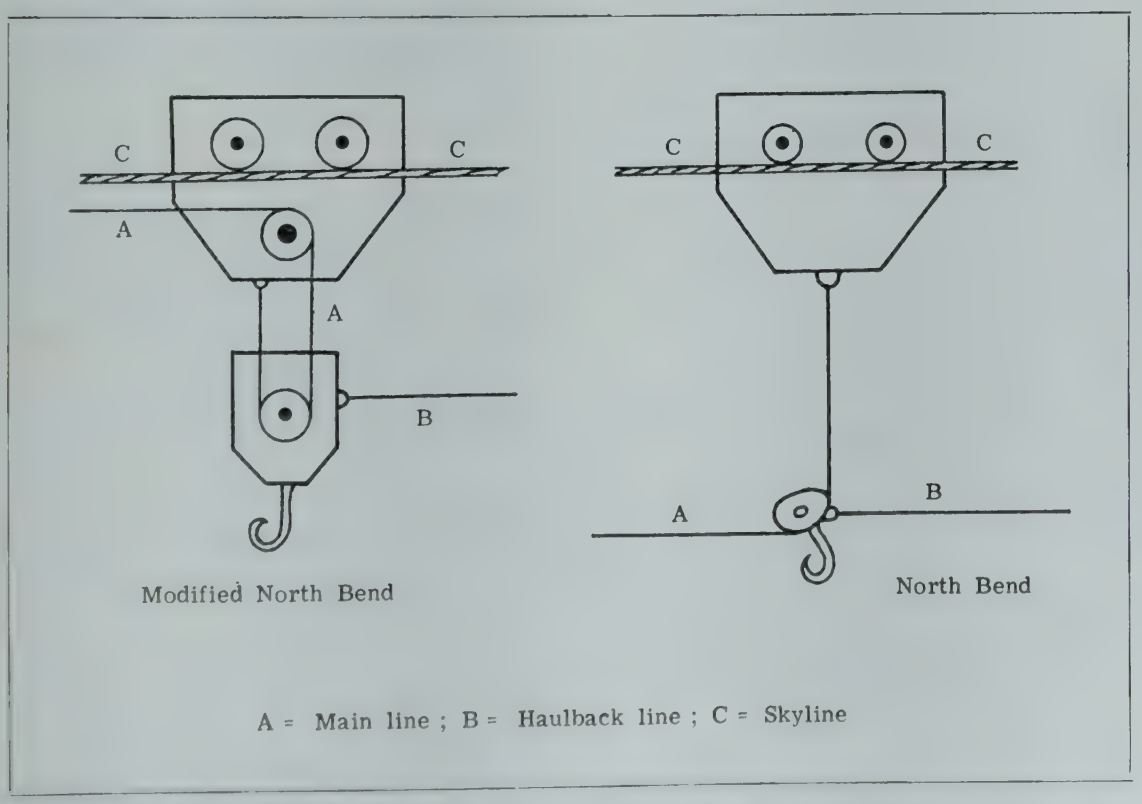


Figure 3. — Difference between the North Bend (right) and the Modified North Bend (left) systems.

The system consists of sweeping a circle or semi-circle, and drawing the wood toward the head spar. The system can be used on flat ground or on slopes.

The logs are skidded on the ground but the Modified North Bend system permits a higher lifting effect of the logs, so the winch can be mounted in the valley to cover short distances.

The difference between the Modified North Bend system and the North Bend system is shown in Figure 3.

The Company uses various installation patterns, which are illustrated in Figure 4.

The tail spar is moved after extracting the wood in a strip describing a semi-circle or full circle. At each installation of the tail spar, 10° apart, the wood is drawn to the head spar at the roadside or in the forest, from which point the wood is transported by another installation.

When the Modified North Bend system is used combined with the skyline system, the North Bend sweeps in a semi-circle or full circle and the skyline system transports the whole or split from the head spar to the roadside.

The winch of the North Bend is produced in Columbia and is driven by a 37.5 hp Lister motor. The Company owns 20 winches.

The average load per trip is 0.68 t (0,85 m³).

The average time of the individual parts of the complete operation, over

a distance of 450 m, is as follows:

Empty trip	1,62 minutes
Loading	2.47 »
Loaded trip	1.88 »
Unloading	0.58 »
Total	6.55 minutes

The time and output formulae for a variable distance would be:

$$T = 3.05 + 0.0078D$$

T = total time, minutes
D = distance, metres
3.05 = loading and unloading time, minutes

$$O = \frac{60 \times 0.85}{T}$$

O = output, cubic metres per hour
T = total time, minutes
0.85 = average load cubic metres (0.8 t = 1 m³)

The resolution of these formulae for distances between 100 and 1 000 m give the following results:

The time study refers to effective working time. To have a better indication of actual output values that would reflect a monthly or yearly average, the output values have been multiplied by 0.75.

The installation of the system on a semi-circular area will determine 18 installations of the tail spar at 10° apart. A circular area will mean 36 installations of the tail spar.

The movement and installation time of the system is 20 hours and the displacement of the tail spar is 16 hours. The total time would then be:

Semi-circular area =
= 20 + 288 = 308 h, 38 days
Circular area =
= 20 + 576 = 596 h, 74 days

The approximate operation cost per hour of the Modified North Bend including labour costs on a 1 750 hour/year basis is 201 p/ha ($6.30/ha).

The total cost per cubic metre for semicircular installation up to a distance of 500 m is:

A) Installation cost per cubic metre:

$$Ic = \frac{Hic \times Tzi}{\frac{\pi R^2 \times V}{20\,000}}$$

Ic = installation cost, pesos/m³
Hic = hourly cost for installation, pesos/m³ (85% of operation cost)

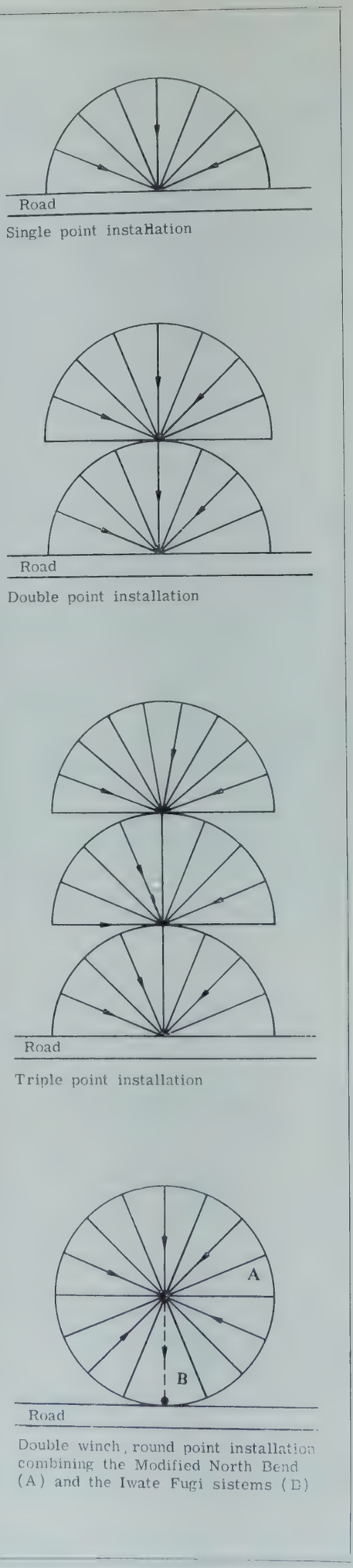


Figure 4. — Installation patterns.

Tzi = installation time, semi-circular area, hours
V = average volume, m³/ha
R = radius of the semi-circle

$$Ic = \frac{171 \times 308}{\frac{3.1416 \times (500)^2 \times 105}{20\,000}} = \frac{52\,668}{4\,123}$$

Ic = 13 p/m³ ($0.41)

B) Operation cost per m³:

$$Oc = \frac{Hc \times O \times PV\ 0\text{-}200}{Y\ 100} + \frac{Hc \times O \times PV\ 200\text{-}400}{Y\ 300} + \frac{Hc \times O \times PV\ 400\text{-}500}{Y\ 450}$$

Oc = operation cost, pesos/m³
Hc = hourly cost, pesos/hr
PV = proportion of volume in area
Y = output, m³/hr

$$Oc = \frac{201 \times 0.08}{10\,000} + \frac{201 \times 0.24}{7 \times 10} + \frac{201 \times 0.68}{5 \times 85}$$

Oc = 1.61 + 6.79 + 23.36
Oc = 32 p/m³ ($1.00)
Total cost = Ic + Oc = 45 p/m³ ($1.41/m³)

Iwate Fuji Skyline system. This has been operated for over a year in the concession with good results. At present 2 winches are in operation. The length of the installation can be up to 1 000 m, but the average is 600 m.

Two of the three drums of the winch are in use. One drum carries the endless cable and the other the main line to lift and lower the load. The endless cable is wound around the drum 7 times and pulls the carriage along the skyline (Figure 5).

The crew of a cable installation is composed of 16 men:

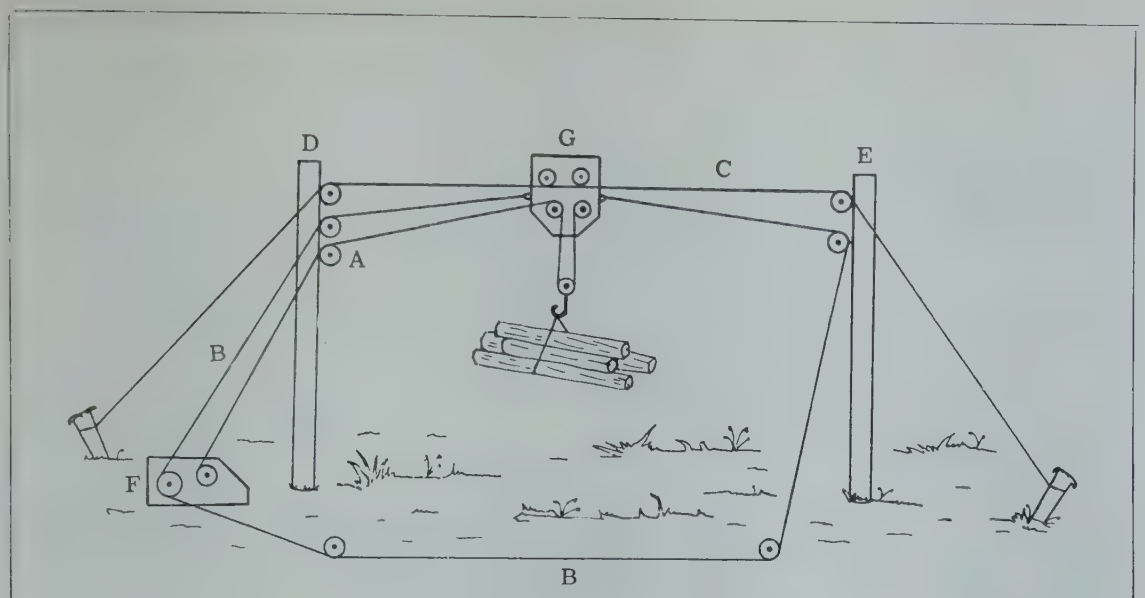
1 winch operator
10 line installers
5 loaders and unloaders

16 men

The winch operator earns 100 p/day ($3.12/day).

The average load is 0.9 t (1.13 m³).

The average time of the individual moments of the complete operations,



A = Main line ; B = Endless cable ; C = Skyline ; D = Head spar
E = Tail spar ; F = Winch ; G = Carriage

Figure 5. — The Iwate Fuji system.

over a distance of 450 m, is as follows:

Empty trip	1.43 minutes
Loading	3.30 »
Loaded trip	1.93 »
Unloading	1.28 »
Total	7.94 minutes

The time and output formulae for a variable distance would be:

$$T = 4.58 + 0.0075D$$

T = total time, minutes
D = distance, metres
4.58 = loading and unloading time

$$O = \frac{60 \times 1.13}{T}$$

O = output, m^3/hr
T = total time, minutes
1.13 = average load, cubic metres (0.8 t = 1 m^3)

The resolution of these formulae for distances between 100 and 1 000 m give the following results:

The time study refers to effective working time. To have a better indication of actual output values that would reflect a monthly or yearly average, the output values have been multiplied by 0.75.

The approximate operation cost per hour of the Iwate Fuji skyline system, including labour cost on a 1 750 hr/yr basis, is 369 p/hr ($11.53/hr).

Installation of the system takes approximately 32 hours. If the skyline system is installed in combination with the North Bend, working up to a distance of 500 m on a semi-circular area the volume hauled would be:

$$V = \frac{\pi \times R^2 \times 105}{20\,000}$$

$$V = \frac{3.1416 \times 250\,000 \times 105}{20\,000}$$

$$V = 4\,123 \text{ m}^3$$

The total cost per cubic metre for an installation of up to 600 m where the North Bend would be installed is:

A) Installation cost per cubic metre:

$$Ic = \frac{Hic \times 32}{V}$$

Ic = installation cost, pesos per cubic metre
Hic = hourly cost for installation, pesos per cubic metre (85 percent of operation cost)
V = volume that will be hauled by one installation

$$Ic = \frac{369 \times 0.85 \times 32}{4\,123}$$

Ic = 2.43 p/m^3 ($0.08/$m^3$).

B) Operation cost per m^3:

$$Oc = \frac{Hc}{Y\ 600}$$

Oc = operating cost, pesos/m^3
Hc = hour cost, pesos/hr
Y 600 = output 600 m, m^3/hr

$$Oc = \frac{369}{5.60}$$

Oc = 66 p/m^3 ($2.06/$m^3$).

Total cost = Ic + OC

Total cost = 68 p/m^3 ($2.13/$m^3$).

The total cost of both installations per cubic metre hauled to roadside is 113 p/m^3 ($3.53/$m^3$)

Transport. In the transport operations one can distinguish two phases: internal transport, and transport to the industry in Cali.

The transport cost from the entrance of the concession to the industry (120 km on the Cali-Buenaventura road) is 126 p/m^3 ($3.90/$m^3$).

For wood transport the Instituto de Desarrollo de los Recursos Naturales (INDERENA) issues a pass. This measure avoids to a certain extent the transport of wood from illegal operations. The pass has a duration of 10 days, and without it the wood is confiscated.

At the entrance to the concession there is a large log yard where internal transport ends. Here the wood is unloaded.

For internal transport dump trucks and platform trucks of a loading capacity of 6-7 t are used. If the truck has a capacity over 8 t it transports directly to the industry. Transport operations are executed on a 15 hour/day basis.

Manual loading is done by a two-man crew, who load six tons in 30 minutes. Unloading is also manual in the case of platform trucks. The loading of the dump truck takes 1 hour.

The cost of internal transport is 42 p/m^3 ($1 31/$m^3$).

Labour aspects

The minimum daily wage is 36 p/day ($1.13/day).

During the year, 240 days are considered as working days. Saturdays and Sundays are not working days, but if occasionally work is done on a Saturday then the wage is doubled.

Colombian law provides that forest workers should work on a 54 hour/week basis.

The workers come from Buenaventura and are provided with daily transport to the concession. Working hours

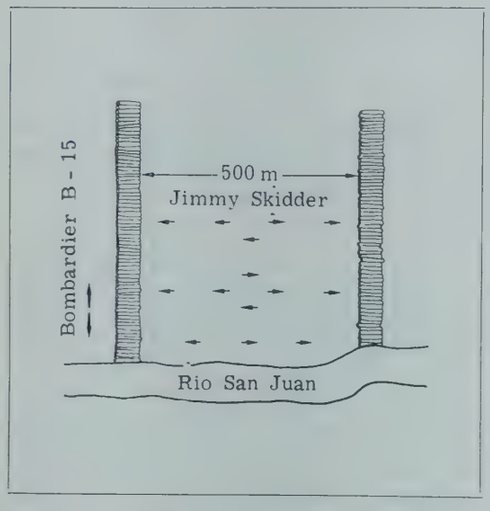


Figure 6. — Organization of extraction of wood using the Bombardier B-15 and the Jimmy Skidder.

are from 08.00 to 17.30 with a lunch break of 1 hour.

Only 20 percent of the workers can read and write.

The personnel working in the concession is as follows:

Administrative personnel	10
Foremen	4
Mechanics	10
Choppers	8
Transport labour	16
For preparation of logs	80
For extraction	120
For roads	8
Total	256 men

If we divide the total yearly production by this number of men we have a relation of 469 m³/man-year, and 1.95 m³/man-day:

$$\frac{12\,000}{256} = 469 \text{ m}^3\text{/man-year}$$

$$\frac{469}{240} = 1.95 \text{ m}^3\text{/man-day}$$

If the administrative personnel and mechanics are not considered, the production would be 2.12 m³/man-day.

Summary of harvesting and transport costs

For quick reference the individual costs have been summarized. Some partial costs have been estimated by the author, as no information was available:

	p/m³	$/m³
National participation	3.50	0.11
Payment to INDERENA for control	10.00	0.31
Roads	45.00	1.40
Preparation of logs	77.00	2.40
Extraction to roadside	116.00	3.53
Internal transport	42.00	1.31
Transport to industry	126.00	3.90
	419.50	12.96
Company overhead costs 15 percent	63.00	1.94
Total cost	P. 482.50	$14.90

The San Juan concession

At present only experimental harvesting operations are proceeding.

The extension of the concession is of 160 000 ha, and the total volume is estimated at 15 million m³ with bark. Of this volume 3.5 million m³ is sawnwood.

The average volume per ha is 108 m³ with bark, and of this 69 m³/ha is usable for pulp. The composition of the forest is 225 usable species. Sawnwood can be extracted to an average of 28 m³/ha with bark.

The concession is situated on the banks of the San Juan River, toward the north of the present concession. It can be reached by crossing the Bajo Calima concession by car and then by boat. The production from this concession will be transported by barges, and the only manual operation will be loading of these barges.

The concession area is 14 percent alluvial and 86 percent low hills.

Experimental logging operations. A provisional camp has been constructed close to the banks of the San Juan River where the bearing capacity of the soil is very low. This area is sometimes flooded.

Poor terrain conditions have determined the introduction of experimental logging equipment produced by Bombardier Ltd., Canada. This equipment consists of 5 Jimmy Skidders and 1 Bombardier B-15 skidder (Figure 6).

The main characteristic is the wide tracks that permit more floatability. Even so, the B-15 cannot operate on bare ground because it sinks. This means that it has to operate on a corduroy road, and has determined the organization of the extraction operations.

A high protection shield welded around the Jimmy Skidder can sink up to 1.4 m into the mud. Problems have arisen with the hydraulic systems of all machines and at all times there is a mechanic present during operations.

Felling is carried out with Homelite motorsaws, Models 923 and 1050, with 25 and 30-inch bar respectively. The latter model is, however, considered to be too heavy.

Skidding operations are organized so that the Jimmy Skidders work on a strip of 500 m to the corduroy road on which the B-15 moves, and skids the logs to the riverside (Figure 6).

The output of the Jimmy Skidder after two months of operation is 17 m³/day with bark, on a 5 effective hour/day basis. This output can of course increase in the future.

The given capacity of the tractor is 5 m³, but under actual working conditions it is difficult that the average volume will be higher than 2.5 m³.

The following formulae can be used as an approximate guide, to determine the output of the Jimmy Skidder:

$$T = 13.57 + 0.064D$$

T = total time, minutes
D = distance, metres

13.57 = fixed time for loading and unloading, minutes

$$O = \frac{60 \times 2.5}{T}$$

O = output, m³/hr
T = total time, minutes
2.5 = average load, m³

The times do not include delays.

The resolution of these formulae for distances between 100 and 1 000 m give the following results:

The time study refers to effective working time. To have a better in-

dication of actual output values that would reflect a monthly or yearly average, the output values have been multiplied by 0.75.

The approximate cost per hour of the Jimmy Skidder including operator and two helpers is 398 p/hr ($12.45/hr), on a 1 500 hr/years basis.

The cost per m^3 over an average distance of 125 km is 42.12 p/m^3 ($1.32/$m^3$).

Legally speaking

Excerpts from the Concession Contract INDERENA-PULPAPEL S.A.

CLAUSE I

INDERENA cedes to PULPAPEL S.A. a Forest Concession a period of 30 years to utilize public forests located in the municipality of Buenaventura Department of Del Valle, over an extent of approximately 53 804 ha, incorporated in an area of 61 500 ha . . . . . The concessionaire accepts the following regulations:

1. concessionaire has the first option permits for utilization of the tree species in the concession area according to an established volume in the management plan.
2. The concessionaire has no rights with regard to house and land of peaceful and quiet farmers or the rights obtained by third parties in the area of the concession. The concessionaire shall not harvest forests located on a 500 m wide strip running parallel to the principal communication routes destined for use by settlers. These communication routes are . . . . . The concessionaire can initiate legal action against whomsoever invades the land ceded to the concessionaire, and will have the support of INDERENA.
3. In no case will the concessionaire receive any indemnity from INDERENA.

. . . . . .

CLAUSE II

The concessionaire will fulfil the following special obligations:

1. Invest in the Organization of harvesting operations and plantations the yearly budget allocated for this purpose and approved by INDERENA.
2. Initiate the management plans within 3 months following the signature of this contract. It is presumed that the management plan is in execution when the concessionaire carries out felling of the allowed volume and the forest is treated according to the plan.
3. Harvest the forest according to the management plan and to the following specifications:

   (*a*) The minimum diameter for pulpwood is 18 cm. The species allowed to be utilized are those indicated . . . . . .
   For the utilization of other species, especially those that can be used for sawnwood, a special permit from INDERENA is required.
   (*b*) Harvest according to the management units.
   (*c*) Perform pre-harvesting inventory with an intensity of 10 percent, including all species over 15 cm, identifying with visible numbers and marks all the species suitable for sawmilling. INDERENA will approve the inventory outline.
   (*d*) Construct main and secondary roads permitting maximum benefit to be obtained from the forest with the minimum damage to vegetation.
   (*e*) Maintain the harvesting techniques, with the obligation of improving methods so as to reduce waste and avoid leaving utilizable wood in the forest, or on the roads and logyards.
   (*f*) In those cases where INDERENA permits the utilization of sawnwood species, these species must be marked.
   (*g*) Prepare maps of the harvested areas and of those under silvicultural treatment.
   (*h*) Prepare in advance maps of the harvesting and silvicultural operations for the following year . . . . . .
   . . . . . .
   (*i*) Maintain a register of the principal harvesting operations:

      1. Felling, area, volume obtained, loss of volume and reasons, output and costs;
      2. Roads, (plan, design construction and costs);
      3. Extraction systems, distance, extracted volume, waiting time and unproductive time, output of equipment and costs;
      4. Transport systems and distance, volume, capacity of equipment and costs.

   (*j*) In relation to the equipment used, the concessionaire is obliged to maintain information on cost-benefit relation, efficiency, production and output.
   (*k*) If areas have to be preserved for ecological reasons, the concessionaire is not allowed to harvest these areas.
   (*l*) During the first year of this contract the concessionaire and INDERENA will select and delimit an area of 5 percent of the total area considered to assure sample units of the natural vegetation.

4. The concessionaire should outline an internal work and security statute and comply with all existing social laws. These statutes, approved by the Ministry of Labour, should be presented to INDERENA within one year.
5. The concessionaire should build schools for the education of the forest workers, their families and children.
6. Every 6 months the concessionaire should present a written report signed by a forest engineer, giving an account of the harvesting operations completed over a

period of 6 months.

7. The concessionaire may not employ foreign personnel above a proportion of 20 percent of their entire staff.
8. Demonstrate the payment of participation revenues and other rights to INDERENA.
9. The concession cannot be transferred to third parties without the authorization of INDERENA.
10. A forest department should be established to take charge of the management plan.
11. The concessionaire should designate a representative to INDERENA to discuss the follow up of this contract.
12. A written report on the execution of the management plan should be submitted every 6 months.
13. The concessionaire shall allow free passage on public roads, access to gas ducts, telegraphic, electric and telephone installations and irrigation canals.
14. Establish plantations with commercial species selected by the concessionaire and approved by INDERENA. The expected volume of these plantations should be equal or higher than the extracted volume at the end of the 30-year period, which is estimated to be 3 661 745 m^3. In case INDERENA and the concessionaire agree that the information to comply with the reforestation programme in the concession is insufficient, a further period of three years will be granted. This period may be extended if INDERENA considers that lack of information still exists or if the reforestation programme can be executed in another tropical forest area.
15. The concessionaire will carry out the investigations proposed in the management plan in collaboration with INDERENA.
16. The concessionaire will establish clear limits of the concession.

Clause III

The concessionaire is bound to utilize the natural forest and to extract the allowed volume, paying to INDERENA the "national participation" in relation to the market value.

The concessionaire will also pay INDERENA the established amount per cubic metre for control and management of the forest.

Payments should be effected every three months according to the volumes indicated in the pre-harvesting inventory.

Clause IV

The management plan approved by INDERENA constitutes the technical basis for managing the concession.

Clause V

The personnel of INDERENA can at any time supervise the management of the concession and the fulfilment of the clauses stipulated in this contract.

Clause VI

The export of forest products should compromise with existing regulations.

Clause VII

The concessionaire is allowed to utilize the plantation, and INDERENA will recommend to the pertinent organizations that the reforested areas are transferred in property to the concessionaire.

Clause VIII

For a fuller utilization of the forest INDERENA can recommend to the concessionaire the utilization of species and products other than those agreed upon. If the concessionaire refuses to utilize these species, INDERENA can coordinate their utilization.

Clause IX

With the exception of the reforested areas INDERENA can decrease the concession area in the following cases:

(*a*) When colonization areas cause problems to the concessionaire;
(*b*) When the produce of the plantations or natural forests exceed the needs of the concessionaire and when no expansion is foreseen;
(*c*) When the concessionaire has sound sound reasons for reducing the area in order to lower harvesting, transport or management costs due to a fuller utilization of the forest.

Clause X

To guarantee the fulfilment of the present contract the concessionaire must deposit an amount of p 1 830 872, corresponding to p 0.50/m^3.

Clause XI

INDERENA can fine successively the concessionaire in case he fails to fulfil points 2, 3, 4, 5, 6, 8, 10, 12, 14, 15 and 16 set out in Clause II.

Clause XII.

The concession will cease in case of:

1. Dissolution of the Company;
2. Bankruptcy of the Company;
3. Failure to fulfil points 1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 14 of Clause II;
4. Failure to fulfil the management plan;
5. Failure to fulfil Clause III.

Clause XIII

When the cause is one of the points: 1, 2, 3, 4, and 5 of the last clause, the concessionaire will receive notice and prepare his defense within 30 days.

Clause XIV

No new concession will be entrusted to the concessionaire for a period of five years after the concession agreement has been declared void.

Clause XV

This contract may be extended upon agreement between the two parties.

Clause XVI

This contract will be published in the Official Bulletin .... at the cost of the concessionaire. ■

Symbiosis of agriculture and forestry

Louis Huguet

It is generally agreed that when genus Homo first appeared on earth, the greater part of the planet was covered with forests. At that time, man was a food-gatherer, living by hunting, fishing and gathering the plant materials he needed for survival. Then, he developed agriculture, learning to use fire, felling tools and simple farming implements which enabled him to clear forests and to cultivate systematically. This development, of course, moved at different rates in the various climatic zones of the world. In fact, still today, in the tropical forests of Latin America, Africa, and Asia, there are many who live at or near the aborigine level.

Probably, in the tropical as well as in the temperate climates, agriculture was based in those days on the use of forests as fallow between two agricultural crops.

At a later period, which varied according to the level of technical development, in the temperate climates agriculture was established on the best lands won from forests, which man had learned to enrich with manure produced by his domestic animals. However, the forest fallow system survived in the temperate zones, which today constitute the industrialized world, into the beginning of this century.

Louis Huguet is Director of FAO's Forest Resources Division and Chairman of FAO's Interdepartmental Working Group on Natural Resources and Human Environment. This article was written originally for the 4th Session of the FAO Committtee on Forestry, held in May 1978.

To be sure, in tropical countries today there exist permanent forms of agriculture and animal husbandry (irrigated paddy fields, tree plantations, and on very good alluvial soils); but we find above all shifting agriculture on forest land cleared by burning which, according to some, may involve 200 million inhabitants and affect 20 to 40 million hectares each year. In drier tropical areas, we also find extensive forms of animal husbandry using burned clearings.

In the temperate countries, deforestation, due to population growth, developed in Europe during the Middle Ages and at the beginning of the colonization of the New World. It stopped only when man was able to increase agricultural yields. Such increases occurred in two stages. First it was a result of the first agricultural revolution in the 19th century (characterized by the elimination of forest and other fallows), and then especially in the 20th century thanks to the very low cost of petroleum which made it possible to use inputs with high energy consumption, such as fertilizers, pesticides and heavy machinery. Such inputs led to spectacular increases in yields. And now the rich countries are preparing to readjust their agricultural production systems in order to save energy: this is the beginning of a new era.

A rapid flight over tropical landscapes pockmarked by countless fields of shifting agriculture or showing a sort of agricultural front penetrating further into dense forest every year might lead us to believe that the tropical world is today in the same position as was the temperate world at the time of its large-scale land clearing. But such a conclusion would be a serious mistake, for several reasons:

- First of all there was no population explosion when land was cleared on a large scale in what became the industrialized world. This is why some balance could be achieved between agriculture and forestry even before the introduction of fertilizers and machines.

- Tropical soils are much more fragile than the soils of temperate countries.

- Tropical countries will never be able to use as many energy-requiring inputs, i.e. petroleum, as the wealthy temperate countries which, moreover, are about to modify their energy-wasting agricultural systems.

- Lastly, poor countries in general still have neither sufficient institutions, nor financial resources, nor personnel to quickly bring about a "new order" in their rural landscape.

At this point, we may ask, what is the place of forests (and trees) in the rural landscape? This is a question which, as we have already seen, must be placed in a totally different perspective depending on whether it concerns the wealthy, temperate, industrialized

world or the poor, tropical, little-industrialized world.

A hasty reply might be that, since the temperate world has reached a fairly stable balance between the forest and agriculture naturally, that is, without the intervention of planners, economists, agronomists, forestry experts and other technocrats, why not let the tropical world also develop naturally? Furthermore, what can a handful of technocrats, whether international or national, do to oppose the action of the millions of people who nibble at forests?

Leaving aside the rich world, where the area occupied by forest is relatively stable and which, in any case, has sufficient human, technological and financial resources to solve such problems, we shall concern ourselves only with the poor world, in general having a tropical climate and little industry. In this world, the "laissez-faire" attitude is more unacceptable than elsewhere. Evolution is too quick and the disruption of so-called natural equilibriums leads straight, and very swiftly, to disaster. The forest is in danger of disappearing irremediably in a short time if nothing is done to arrest its degradation or destruction. Yet the forest is indispensable not only to raise the already very low standard of living of the rural population in poor countries, but also, quite simply, for their survival.

It is not necessary here to dwell on the essential and indispensable nature of forests; suffice it to repeat that the destruction or degradation of original forest, unless it is replaced by one that is more productive but has the same environmental value, can cause irreversible damage to the general environment and contribute to what is called the death of our planet. But the millions of poor and ignorant small farmers are little concerned with the long term: they and their families are obliged to live from day to day in order to survive. And if they are not assisted technically, informed, convinced and trained and if they are not allowed to participate, they will continue their work of destruction. Certainly, the same crisis occurred in today's rich countries, but, for the four reasons listed earlier, it did not produce the disastrous consequences — for example, desertification — which it has already brought about in the poor countries of the tropics.

In these countries, the forest must, in spite of everything, be preserved where it exists and, where it has disappeared, be restored or replaced by better forests. To achieve this, the forest, and trees in general, should be integrated into the rural landscape in ways appropriate to the ecological, social and economic conditions of the region or the local area concerned. It is necessary — and this is where the major difficulty arises — to reverse an accelerating trend and make the very people who are the agents of the present disorder, the poor farmers of tropical countries, accept a "new rural order."

Thus, the problem is to integrate, to harmonize within the same management unit (a local area, a watershed or a sub-watershed) the possible land uses such as animal husbandry, agriculture, forestry, industrial plants, roads, towns and villages. Naturally such local integration must itself be harmonized with general development on a national scale. As a result, integration of different land uses can be defined as follows: Use of a territory or part of it simultaneously, or sequentially, to achieve several different objectives, while seeing to it that the interactions between the different uses (e.g. agriculture, animal husbandry, forestry) result in sustained and increasing production of goods and services. In short, integration of the various possible uses of rural areas, and hence determination of the place of the forest in those areas, is a task of economic and social optimization.

Such integration involves a fundamental social and human dimension in the sense that it is possible only to the extent that it is accepted and, if possible, provoked and requested by the rural communities themselves.

Whe repeat we are dealing here primarily with tropical countries, that is, those located between the tropics of Cancer and Capricorn. But our considerations can also apply to dry or arid Mediterranean countries sharing such important aspects with tropical countries with low or irregular rainfall, as extremes of climate and fragility of soils. Furthermore, in these countries special attention must be paid to mountain areas, because the last remaining forests have to be maintained there since the plains (as in the wealthy countries) would have to be reserved for intensive, relatively mechanized and more or less modern agriculture; because those are the regions where the destruction or degradation of forests can have the most disastrous consequences for the environment; and because it is in those areas that the poorest population, those least concerned with long-term effects, take refuge.

In this context, forests and trees can be integrated into the rural landscape in three main ways; as permanent forest or estate forest; as fallow forest; and as forest in symbiosis with agriculture.

Permanent forests. This is the type of forest primarily, although not exclusively, known in rich temperate areas and to which traditional forestry services are accustomed. In the tropical countries, it has so far been very difficult to make farmers who are hungry for new humus-rich land respect such permanent forests. Forests have barely survived only where poor farmers (who often follow loggers) could not yet penetrate, for example in Amazonia, in the heart of central Africa and in some remote areas of Indonesia, the Philippines or Malaysia. However, even in those areas destruction or degradation has already started as a result of immigration from poor and overpopulated regions, accelerated by the construction of access roads.

In theory, it is possible to determine the part of the territory where the forest should remain stable, be it the more or less managed original forest or a new forest which is more productive but provides the same services. This is a matter for economic analysis, but in forestry it is complicated by the characteristics of this form of land use, i.e. long-term considerations and indirect benefits which are hard to calculate, including the intangible benefits connected with recreation. But even the best land-use plan is only feasible to the extent that it is freely accepted by those concerned, that is by the poor farmers, and we shall return to this point later.

Fallow forest. Forests served as fallow areas in the temperate world that

THE "COLTURA PROMISCUA" OF A TUSCAN FARM IN CENTRAL ITALY
aesthetic, agriculturally productive and ecologically balanced

is rich today, as we have noted. They continued to play this role in vast regions of the tropical world (200 million people, involving 20 to 40 million hectares per year). In the face of this accelerated destruction, whose rate increases with the number of people living around the forest, there are two possible approaches: either settle the population now engaged in shifting cultivation on permanent agricultural plots in the future (which also means determining the areas to be maintained as forests) or preserve the forest as fallow, but using a better forest, a man-made forest, between two crops. The latter is the agrisilviculture system.

The choice must be made for each particular case in line with the specific technical, economic and social conditions of the area concerned, particularly on the basis of the following criteria:

- It may be dangerous to replace shifting cultivation which has proved its worth despite all its faults by a new, still untried system. We may also ask whether we can at this stage safely recommend permanent cultivation methods of the type used in wealthy temperate countries, except possibly for rice cultivation and tree crops (see symbiosis below). In fact, it is not certain that our technical knowledge is adequate everywhere.

- Even if the methods of establishing permanent agriculture were known, they would have to be applied. This presupposes the creation of institutions and training of qualified personnel at all levels, including especially extension workers living in contact with farmers and willing to accept the hardships of life in remote tropical rural areas.

- For lack of adequate technical and financial resources, farmers in poor tropical areas cannot afford to use, let alone purchase, the inputs (fertilizer, pesticides, etc.) whch have enabled wealthy temperate-zone countries to increase agricultural yields considerably and therefore to reserve non-agricultural areas for forest. In poor countries fallow forest, together with the utilization of forest litter as humus and nutrients for agricultural crops, is today the main known and practicable way to restore soil fertility while pre-

serving the environment, at least as long as population density remains below a certain threshold. The application of forest litter — leaves and humus — for farm crops can also serve, before such use as litter for livestock, thereby becoming enriched by their excreta.

Agrisilviculture, regarded as an improvement on shifting cultivation, is the easiest and most immediately applicable method known at present, considering the possibilities of the characteristics of the social context concerned. However, it is recognized that it is only a stage toward a more stable type of agriculture which will probably not be copied from the wealthy and temperate countries, as we shall see below. Thus, all efforts to improve this system of shifting agriculture or agrisilviculture should be encouraged.

Forests in symbiosis. In the two previously described systems, the forestry sector was relatively distinct from the agricultural sector both in space (permanent forest) and in time (fallow forest and agrisilviculture). The system we call "forest in symbiosis" involves co-existence of the forest with agriculture both in time and space. In this system, we must distinguish what is traditional and what is less so (which concerns primarily the tropical countries).

Loose symbiosis: a traditional pattern. This refers, in the first place, to hedges and windbreaks which also regulate micro-climate areas, constitute refuges for wildlife and produce wood for common uses (firewood, stakes, posts), but also to plantings along roads, rural irrigation canals and anti-erosion terraces. It also applies to small groves a few hundred square metres in size, located around dwellings or scattered in the fields where domestic or wild animals take shelter in periods of extreme heat, extreme cold, or on windy days.

Close symbiosis: a less traditional pattern. People who have visited Tuscany have been struck by what the Italians call *coltura promiscua* (mixed cultivation). The same field has trees (generally maples and elms), vineyards supported by tree trunks and branches and, between the rows of trees, one or two crops during the year.

This system is not only productive but creates a landscape or environment which is considered one of the most harmonious in the world, in any case more so than the wide wheat plains of the Paris region or the flat expanse of vineyards of southern France. As for the poor tropical countries, any attempt to copy so-called modern agriculture symbolized by the great plains of the American Middle West is out of the question. That type of agriculture is based not only on a relatively low population density but also on a very high technical level and, above all, on high-energy inputs (fertilizer, pesticide, heavy machinery) which farmers of tropical countries have never been able to purchase and generally speaking, will be even less able to afford in the future. The only solution seems to be a type of agriculture as self-reliant as possible, based on the natural (but intensified) production capacity of natural resources which, themselves, cost nothing. These resources are soil, water and sun: that is, chlorophyll assimilation. This type of agriculture must try to lose nothing, to recycle all its wastes, whether vegetal, animal or human. Therefore, the association of animal husbandry, aquaculture and, as we shall see, forestry with agriculture is indispensable to make the most of all the production factors (sun, water, soil, etc.).

Rethinking agricultural systems

The rich countries themselves, knowing that they will be unable to afford as much energy in the future, are thinking of re-adjusting their agriculture along these lines. This is all the more reason for the poor countries to do so as quickly as possible.

In fact, this type of agriculture already exists in some parts of the tropical world, as for example, in Tanzania among the Shambalas in the Usambura Mountains and the Wakaras on Ukuru Island in Lake Victoria or — a classical example — the Chinese communes.

In this symbiosis, the tree has an important role to play through its crown and its roots. First, through its crown it protects the soil and the crops over which it stands both against too much exposure to the sun and against the impact of violent tropical rain, the two main factors in the degradation of tropical soil. Furthermore, by constituting an additional level of photosynthesis, it allows for the maximum utilization of sunrays for productive purposes, provided that the mixture of trees and crops is suitably formed. Second, through its roots draws from the deeper soil layers the nutrients which restored to the surface layers, and thus to the crops and plants. The falling dead leaves, moreover, reconstitute the stock of organic matter in the surface soil.

This "coltura promiscua" already exists in some tropical areas. It is the typical "tropical garden" which seems like a tangle to the inexperienced visitor but has good reasons for its existence. This method of integrating trees with agriculture deserves to be improved, disseminated and recommended.

Because of the goods they produce and the services they provide, it is generally acknowledged that forests or trees have an essential and irreplaceable role to play in the rural context. We have first reviewed a wide range of types of integration of tree vegetation into the rural landscape. We believe that one or another of the methods described here, or several of them combined, can be suitable for practically all technical, economic, social and financial conditions of tropical countries, even those where population density is too high (for example, rice cultivation on the island of Java).

Accordingly, such integration is our objective but, at the same time, it is its own means. In other words, the poor peasant destroys the forest and trees because they compete with his agriculture, including animal husbandry. Therefore, the poor farmer will accept the forest or trees only if they are integrated or harmonized with his agriculture and are advantageous to him. Finally, greater respect for the forest and trees can only come from better use of natural resources directed toward higher food production which is the daily, acute concern of poor farmers.

We believe we have shown that there are technical solutions; however we acknowledge the need to improve and

refine them. Research and experimentation should certainly be pursued and intensified, but it seems to us that we already know enough to take action. However, a serious constraint hampers the dissemination of sound methods for the integration of the forest in agriculture or simply the intensification of agriculture which is a prerequisite. With certain exceptions, this is the under-administration or understaffing of the poor rural world.

The establishment of suitable institutions for training competent personnel who work as closely as possible with poor farmers is a fundamental problem. It is also out of the question to impose ready-made solutions, prefabricated outside, on rural communities. That explains the importance FAO attaches to forestry for rural community development, carried out for communities and by communities.

In this connection, we may quote Pierre Gourou, the great geographer, who wrote, in 1968, after 40 years of a career devoted to careful and minute study of the problems of the tropical world:

"Economic backwardness in the tropics is due to technical lag. Under the present conditions, the most depressing technical lag is that of organizational techniques. Their improvement is a necessary condition of progress in the tropical world. The administration of a backward country requires no less attention, personnel and competence than does the administration of a developed country. The agriculture of a backward country calls for as many soil scientists, entomologists, geneticists and agronomists as does the agriculture of a developed country. The first condition for economic progress is not economic but administrative; a backward country will make economic progress if it has a sufficient number (i.e. personnel of the same level as those in the developed countries) of administrators, physiscians, entomologists, agronomists, etc." [1]

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[1] Pierre Gourou, *Leçons de géographie tropicale,* Mouton, Paris. p. 242. (FAO translation.)

AGRISILVICULTURE IN CHINA: WINDBREAK TREES, MAIZE AND SHEEP
a harmonious landscape

What is the ECE Timber Committee?

For forestry, it looks at the common economic and technical interests of 34 governments which might otherwise tend to go separate ways in Eastern and Western Europe, the Soviet Union and North America

Thirty-four countries in Europe and North America cooperate on forestry and forest products matters in the ECE Timber Committee, a principal subsidiary body of the United Nations Economic Commission for Europe (ECE), based in Geneva. Countries which are members of the United Nations but not of ECE may — and often do — participate in activities of the Committee which are of particular concern to them.

Many aspects of the ECE Timber Committee's work are of interest not only to the officials directly concerned, but also to other experts in the forest products sector.

Representatives of trade and industry, research institutes and universities take part in the activities organized by the Committee as advisers to national delegations.

International organizations, both governmental and non-governmental, contribute to the Committee's work in a consultative capacity.

The Committee was founded in 1947 in order to allocate after the war the limited available supplies of sawn softwood and pitprops needed for the reconstruction of Europe. With the establishment of a peace-time economy and the rapid growth in demand for forest products, its activities have broadened in response to changing needs to include other products, notably hardwoods, wood-based panels and pulpwood, technical questions of timber harvesting, processing and utilization and analysis of long-term trends.

The ECE Timber Committee now has eight main fields of work:

- Analysis of forest products markets.
- Standardization of forest products.
- Long-term trend and prospects for forestry and the forest products sector.
- Economic and technological problems in the wood-working industries.
- Utilization of forest products.
- Improvement of forest working techniques and training of forest workers.
- Environmental problems and conservation of resources in the forestry and forest products sector.
- Statistics of forestry and forest products.

Seminars and symposia

Attendance at seminars and symposia organized by the Committee is open to experts in the subjects to be discussed, with the permission of their governments.

Meetings in the Committee's programme (1979-80) include:

1979

Utilization of tropical hardwoods, Amsterdam, Netherlands, 15-18 May
Forest resource assessment, Geneva, Switzerland, 21-23 May
Effects of air-borne pollution on vegetation, Warsaw, Poland, 20-24 August
Mechanization and techniques of thinning operations, Nancy, France, 17-22 September
Problems and policies relating to the forestry and forest industry sector in southern European countries, Lisbon, Portugal, 17-21 September
Economic and technical developments in the furniture industry, Poznan, Poland, 5-10 November

1980

Vocational training for small forest owners and farmers, Norway, March

Afforestation and reforestation machines and techniques, Madrid, Spain, April
Modernization in the wood-based panels industries, Helsinki, Finland, May
Forest fire prevention and control, Poland, June
Applied ergonomics and safety and health in highly mechanized logging operations, Canada, August
Technical and economic aspects of the production and use of finger-jointed sawnwood for structural purposes, Norway, autumn.

The programmes of seminars and symposia are usually announced in the trade press some six months before they take place.

Study tours

A study tour is organized each year by a member government, usually between May and October, to present aspects of forestry and the wood-processing industries in its country to ECE Committee members. Interested exporters, with the approval of their governments, take part in such tours. The 1979 tour took place in the USSR, 2-14 September.

Information on seminars, symposia, study tours, publications or other features of the Committee's activities can be obtained from:

The Chief, Timber Section,
Joint ECE/FAO
Agriculture and Timber Division,
Palais des Nations, CH-1211
Geneva 10, Switzerland.

Publications

The FAO/ECE *Timber Bulletin for Europe* and its supplements give wide diffusion to the results of the ECE Timber Committee's work. Regular supplements include:

- An annual review of forest products markets in the previous year (published July/August).
- The Timber Committee's analysis of trends in the current year and prospects for the coming year (published November/December).
- Medium-term surveys, in greater detail than the annual reviews, of markets for particular forest products (in a three-year rotation: 1977 — wood-based panels, 1978 — sawnwood and sawlogs, 1979 — pulpwood, pitprops and miscellaneous roundwood, etc.). The structure and capacity of the wood-based panels and sawmilling industries are also analysed in the appropriate surveys.
- Papers presented to seminars and symposia held under the Committee's auspices.

A study of particular interest is *European timber trends and prospects, 1950 to 2000* (supplement 3 to volume XXIX of the *Timber Bulletin for Europe*). The price of this study is US$17.00 or the equivalent in other currencies.

SECRETARIAT

The ECE Timber Committee shares a Secretariat with the European Forestry Commission of FAO. Both bodies contribute staff members to the joint division. This arrangement ensures close coordination between the two. The FAO body is concerned primarily with problems relating to the forest and forestry and the ECE body with wood, from felling to final utilization. The existence of joint subsidiary bodies, in the fields of forest working techniques and of statistics, furthers this coordination. The Joint ECE/FAO Agriculture and Timber Division will provide on request information about the work of both the ECE Committee and the FAO Commission and their subsidiaries.

SELECTED PUBLICATIONS

The *Timber Bulletin for Europe*

Two numbers of the *Bulletin* appear each year, one with statistics for the period January-June and one for January-December. The *Bulletin* provides quarterly data of the production, trade (export and import, for most products by origin and destination) and prices in the ECE region of the major forest products. The January-December *Bulletin* is somewhat more detailed, especially as regards trade flows.

Supplements to the *Bulletin* issued since 1970 are listed below (date of publication in brackets). Recurrent publications, such as the market reviews, have been omitted except for the most recent issue.

Vol. XXV:

(3) Papers presented to the Symposium on coordination between forestry and the wood-using industries (2 volumes) (April 1973).
(5) Utilization sector study: railway sleepers (July 1973).
(6) Classification and definitions of forest products (advance version) (August 1973).

Vol. XXVI:

Lectures delivered to the thirty-first session of the Committee (December 1973). The lectures covered (*a*) stress grading of sawn softwood, (*b*) structural and geographical advances in the industrial use of timber in the USSR and (*c*) the outlook for timber in the United States.
(4) Medium-term survey of the wood-based panels sector (June 1974).

Vol. XXVII:

(3) Medium-term survey of the trends in the sawnwood and sawlog sector (December 1974).

Vol. XXVIII:

(2) Papers presented to the Symposium on the modernization of the sawmilling industry (2 volumes) (November 1975).
(4) Papers presented to the Symposium on "Forests and wood: their role in the environment" (3 volumes) (February 1976).

Vol. XXIX:

(3) European timber trends and prospects, 1950 to 2000 (1976).
(4) Forest products statistics. Part I - production and trade, 1964-74 (March 1977).

(5) Forest products statistics. Part II - apparent consumption, 1964-75 (1977).
(6) Papers presented to the Symposium on extending the use of wood residues (2 volumes) (June 1977).
(7) The causes of cyclical fluctuations in the markets for forest products and ways to reduce them (January 1977).

SUPPLEMENTS TO THE FAO/ECE *Timber Bulletin for Europe*

Title

VOL. XXX:

(1) Annual Forest Products Market Review (referring to 1976 and the early months of 1977) (July 1977).
(2) ECE recommended standard for stress grading of coniferous sawn timber (December 1977).
(3) ECE recommended standard for finger-jointing in structural coniferous sawn timber (December 1977).
(4) Forest Products Market Trends in 1977 and Prospects for 1978 (based on the review of markets at the Timber Committee's thirty-fifth session, 17-21 October 1977) (December 1977).
(5) Investment in the forestry and wood-processing sector (lectures delivered to the thirty-fifth session of the Timber Committee) (February 1978).
(6) Forest Products Statistics: Price Series, 1950-1976 (January 1978).
(7) Long-term price trends for forest products in selected European countries (April 1978).
(8) Medium-term survey of the wood-based panels sector (including a survey of production capacity and raw material consumption) (February 1978).
(9) Forest and forest products — Country profiles: No. 1, Greece (April 1978).
(10) Study on the trade and utilization of tropical hardwoods (July 1978).

All supplements to the *Bulletin* are available in English, French or Russian, except the proceedings of seminars or symposia, which are issued in trilingual versions. The *Bulletin* itself is published in a bilingual English/French version.

HOW TO OBTAIN THE *Timber Bulletin for Europe* AND ITS SUPPLEMENTS

The *Bulletin* and its supplements may be obtained from bookstores and distributors throughout the world. Consult your bookstore or write to United Nations, Sales Section, New York or Geneva.

A list of distributors may be obtained from the Sales Section. You may also place a standing order for the *Bulletin* and its supplements with your distributor.

OTHER DOCUMENTS

In addition, the following publications are available free of charge on request directly from the Timber Division:

- List of organizations engaged in forest working techniques, mechanization and/or environmental problems related to forestry (TIM/EFC/WP.1/6, English, French or Russian).
- Papers presented to the Symposium on multi-purpose logging machines, 1975 (TIM/EFC/WP.1/SEM.2/2, English, French or Russian).
- Papers presented to the Symposium on the harvesting of a larger part of the forest biomass, 1966 (TIM/EFC/WP.1/SEM.3/3, trilingual). ■

New paper fibre recovery system

A new method for recovering raw material from mercury-containing fibre sediment in water courses at old pulp mills has been developed by the Swedish Water and Air Pollution Research Laboratory (IVL). The method, developed on behalf of Westerviks Pappersbruk/PLM, is based on a fractionating process, where finely dispersed substances such as clay and mud are separated and the fibre content of the large amounts of sludge can be recycled. In all, about 10 million tons of fibre, containing about 150 tons of mercury, have been discharged into water courses from the paper and pulp mills in Sweden, the Swedish Pulp and Paper Association says in a report on the method. IVL, in a recently completed study, estimates that several hundred thousand tons of this fibre that are now lying at the bottom of water courses could be utilized for paper pulp production.

Two pesticides to be banned in the United States

The United States Environmental Protection Agency (EPA) has announced that by 1 July 1983 the use of the pesticides chlordane and heptachlor will be virtually banned. They will be allowed only for underground control of termites. The EPA said that the pesticides caused cancer in laboratory animals.

National Parks Planning

Forestry Paper No. 6, 1978
FAO Technical Papers. FAO, Rome, Italy. 41 p.

The Forestry Department of FAO has been and continues to be involved in assisting member countries with the planning and management of their national parks. The original Spanish version of this manual was prepared for a project in Latin America. There was, however, an urgent need for a similar publication in other parts of the developing world. An English version was therefore produced which became available in March of 1978. The manual incorporates a synthesis of experience gained by FAO in this field and is illustrated with annotated examples drawn from the plans of individual national parks of many parts of the world.

Its three basic sections are headed (1) The Resource, (2) Background Information, and (3) Management and Development. The manual is not a textbook, but a guide on what data are needed and how they should be presented in planning national parks and related areas, cultural monuments or biological reserves.

The FAO Technical Papers are available through authorized FAO Sales Agents or directly from Distribution and Sales Section, FAO, 00100 Rome, Italy. ■

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All those people...

and signs of stress on the world's principal biological systems — fisheries, forests, grasslands, croplands

The twenty-ninth day, by L.R. Brown. W.W. Norton and Co., New York, 1978. 363 p.

The population of the world is estimated at more than four thousand million. It took some two million years for human numbers to reach one thousand million; the second thousand million took a hundred years, the third was accomplished in 30 years, and the fourth thousand million made it in only 11 years. This book is about what that means in relation to food, energy and income.

United Nations projections show world population continuing to grow until it reaches 10 to 16 thousand million but the author does not believe that this is realistic. He sees signs of stress on the world's principal biological systems — fisheries, forests, grasslands and croplands — and claims that in many places these systems already have reached the breaking point. To expect these to withstand a tripling or quadrupling of population pressures, says Brown, defies ecological reality.

The total world fish catch is 70 million tons annually, 60 marine and 10 inland. It is pointed out that the productivity of marine fisheries in some parts of the world is now falling as the catch exceeds the regenerative capacity of the various species of fish. But as the world fish catch levels off or drops, pressures on land-based biological systems are intensifying.

The forests provide lumber, a universal building material, firewood, a principal source of energy for close to one third of humanity inhabiting mostly developing countries, and raw material for paper and a host of other products. These forests have proved to be one of humanity's most valuable economic resources and consequently one of the most heavily exploited. But in many parts of the world, especially in the tropics, they are shrinking rapidly before the onslaughts of firewood-gatherers, land-hungry farmers, and industrial timber interests. Almost every country undergoing rapid population growth is fast being depleted of forests, reminding one of Chateaubriand's remark, "The forest came before civilization and the deserts after it".

A STREET SCENE IN BANGLA DESH
population affects everything

The grasslands support dairy cattle, buffalo, camels, goats and sheep which supply most of the world's meat and milk, sustain draught animals that till a third of the world's croplands and provide a number of raw materials for industrial use. Together, population growth and affluence and consequent increasing demand for protein and other animal products are taxing the grassland where overgrazing is already commonplace.

The croplands occupy one tenth of earth's land surface. But the growth in demand for food and other products of the tilled fields is expanding at a record pace subjecting croplands to heavy pressure. Fallow cycles are everywhere shortening, and farmers seeking land are moving up on to steep slopes and into soils of marginal quality and low fertility where they should not be. Brown does not forget to point out yet another aggravating burden — that of excessive waste caused by burning of fossil fuels, discharge of industrial waste and use of agricultural chemicals, all overtaxing the earth's natural function of waste absorption.

The author makes the point that as ecological stresses increase they quickly turn into economic ones such as inflation, capital scarcity and unemployment. It is noted that historically inflation was a localized phenomenon experienced by individual countries from time to time, but during the 1970s it assumed global dimensions; Brown has an interesting analysis of this development. Concerning investment capital, he notes that di-

minishing returns, typical of the food and energy sectors, make capital formation more difficult and that capital shortages are spreading. As to unemployment, the global labour force is growing at a record rate while the scope for creating new jobs is limited. New land for settlement has become scarce or concentrated in few hands, opportunities for rapid economic growth are subsiding and the expanding number of the jobless is becoming a serious burden in too many countries of the world.

In the closing part of the book the author suggests measures to meet this avalanche of problems. Political will and human ingenuity are needed above all.

Adjustments in consumption patterns, shifts to renewable energy resources and rural reforms, such as redistribution of land so that those dependent upon if will own it and have the incentive to improve it, are some of the measures suggested to overcome food shortages and to stimulate production. Concerning declining oil reserves, Brown calls for crash programmes in energy conservation and a broadly based global effort to develop the entire range of renewable energy resources.

The author is adept at putting forth global issues, particularly in his analysis of the four major biological systems on which humanity depends for food and industrial raw materials. But he is definitely stronger on the horrors than on the ways to dispel them.

P. Argal

United Nations primer on desertification

Desertification: its causes and consequences. Compiled and edited by the Secretariat of the United Nations Conference on Desertification, Nairobi, Kenya, Pergamon Press, Oxford, New York, Toronto, Sydney, Paris, Frankfurt, 1977. 448 p.

Desertification has intensified in recent decades throughout the world. It is now threatening the future of over 600 million people inhabiting arid and semi-arid lands that cover more than a third of the earth's land area.

This volume, comprising four global reviews and an overview, was prepared as a background document for the delegates to the United Nations Conference on Desertification held in Nairobi from 29 August to 9 September 1977 and examines the interrelationships of desertification with climate, ecological change, population, society and technology.

The conference found its origin in the awareness of the Sahel drought disaster, the long drought along the southern margin of the Sahara, between 1969 and 1973. Its tragic effect not only generated an international relief effort to distressed countries, but also attracted attention throughout the world to the chronic problem of human survival and development on desert margins and led to a call for countermeasures to the spread of desertification. The conference brought together the representatives of about 100 countries and many international and non-governmental organizations.

The volume opens with an overview that synthesizes the four global reviews, which are sectoral and technical in character, and not only elaborate the causes and consequences of desertification but also provide scientific justification for its cure.

A scholarly study by F. Kenneth Hare, "Climate and desertification," looks into the relationship of desertification to climate. It points out that the large-scale climate of the earth is governed mainly by global distribution of radiative energy, by the inequities of land and sea and by the general circulation of the atmosphere and oceans. Discussing the drier climates, which occur at sea as well as on land, the author states that they are caused largely by atmospheric subsidence which on an unequally heated earth always occurs in subtropical latitudes, between latitudes 15 and 30 degrees north and south of the equator. Therefore, deserts must always have existed in the earth's subtropical zones. The variability of dry climate is reviewed on both long and short time-scales. The recent droughts in the Sahel and elsewhere are not considered as unprecedented, prolonged desertification lasting a decade or more being common in the records, a phenomenon to be anticipated at long intervals. The author is of the view that the world climate appears to have remained fairly constant during the past two thousand years or more. As to the role of man in influencing climate changes, it is stated that major shifts of climate are related to global changes in the general circulation of atmosphere and its oceanic interactions and are beyond the influence of man, but deteriorating surface microclimates and increases in albedo (the latter causing further decrease in rainfall) directly flow from overstocking or unwise cultivation of dry-land surfaces during periods of drought. For amelioration of present conditions better land use (leading to improved microclimates), precipitation enhancement by artificial means in the more humid areas of dry regions, and realistic use of existing climatic statistics for decision-making are suggested.

The contribution by A. Warren and J.K. Maizels, "Ecological change and desertification," deals with land-use practices in dry ecosystems and their impact on environment. Evidence for desertification (sustained decline in biological productivity of a dry area accompanying certain kinds of environmental change, both natural and induced), which is diffuse and difficult to quantify, is reviewed. Patterns of production and strategies of resilience are discussed.

Land-use practices such as pastoralism or herding of livestocks, rainfed cropping, irrigation agriculture, land clearance for industry or housing, wood collection for fuel and construction, and the changes induced by them are discussed, pointing out that no land-use system has been so self-regulating or so perfectly adopted to arid conditions that it has incurred no cost to the environment. For example, in irrigated agriculture, particularly where drainage is poor and leaching inadequate, waterlogging often causes salts and alkali to infect soils, adversely affecting plant growth; clearing land for industry and especially for mining, increases areas of bare ground which entails erosion, surrounding streams get choked with sediment and toxic

wastes are added to the environment. Intensive gathering of firewood — the main source of energy for cooking among most dry-land populations — leads to destruction of trees and shrubs, exposing soil to wind and water erosion. Desertification has, in fact, accompanied all land-use systems (disturbing the ecological balance), its effects being less destructive in the past when people were few and land less densely occupied. Existing methods of evaluating the extent of desertification are reviewed and a simplified method of rapid assessment suggested. For successful exploitation of dry ecosystems, strategies based on ecological principles are sugested.

The global review contributed by R.W. Kates, D.L. Johnson and K.J. Haring, "Population, society and desertification," states that desertification is a complex problem and is the product of interaction between social changes, climate and ecosystems.

Drought can lead to desertification by decreasing vegetative production and delaying its recovery rates. Exceptionally wet periods may also promote desertification by encouraging extension of agriculture and pastoral settlement into areas generally too dry to utilize and by encouraging an intensified pattern of land use.

Discussing the social causes of desertification, the most important processes of social change which serve as contributors to desertification are those usually associated with, (*i*) rapid change in number of people utilizing and dependent on resources of dry lands, (*ii*) differential access to technology, (*iii*) the political structure of regions and countries, (*iv*) world integration and specialization, and vulnerability of traditional livelihood practices to external market forces. Discussing the association of political structures with desertification, the authors point out that both positive and negative consequences flow from government actions. For example, the security, technology, organization and support provided by government to irrigation and run-off systems helps to increase productivity, but often spreads salination, or diverting former grazing land to agricultural use adds to desertification pressures on adjacent rangelands.

The volume is concluded by a review from M.A. Garduno, "Technology and desertification." It describes, evaluates and discusses appropriate technologies to combat desertification in different land-use systems for the purpose of improving productivity by preventive measures, halting and reversing desertification by corrective measures, and for reclaiming desertified areas. Desertification can be remedied with the help of technology now available, says Garduno, but the results should be worth the cost and the selected technology should be appropriate.

This well-produced volume will probably be a standard source on causes and consequences of desertification for years to come.

P. ARGAL

Trees for dry lands

Reforestation in arid lands, by Fred R. Weber. Frederick J. Holman (illustrator) and Virginia C. Palmer (editor), 1977. Action/Place Corps Program & Training Journal Manual Series No. 5. VITA Publications Manual Series No. 37E, 248 pages. Price: $6.50.

This manual has been prepared as a practical aid to grass-roots action in reforestation and revegetation in arid zones. Though its main references are to the West African areas of summer rainfall, it contains much that is useful to workers in different climatic zones. Textbooks usually contain hopeful statements about the long-term view that must be taken in land-use planning in arid zones and practical manuals tend to concentrate on techniques without regard to the overview. This book contains both approaches, and its second chapter is a good summary of considerations in planning. The illustrations of Frederick Holman are a useful addition, especially as those who use the book are not likely to have libraries nearby. There is a short chapter on the importance of soils, followed by one on the choice of species. This is especially oriented toward West Africa, and it is here that the title appears to promise more than the book contains; "Reforestation in the dry zones of West Africa" would have been more accurate, and the book would certainly not suffer from this change of title. A failing of the book is its lack of proper explanation about various species. For instance the author refers to *Eucalyptus* noting that it is not native to Africa (but failing to note that Neem, *Azadirachta indica,* is not native either), without giving species. Of the total of over 600 species of *Eucalyptus*, about 10-20 may be suitable for dry zones, and these deserve listing more fully, if planting disasters are to be avoided.

There is a section dealing with the importance of project planning, and Appendix D provides a very simple check-list of points to be considered in drawing up a project. Quite rightly, the author points out the importance of including vital information for funding organizations to consider a project.

The bulk of the book is taken up with 128 pages of species identifications, with drawings reproduced from a number of standard botanical works. The drawings vary in quality but are generally good, and the species are almost all West African in origin. For many of them West African local names are given in several languages, which should be very valuable to field workers in the Sahel. *Eucalyptus camaldulensis* is the only eucalypt mentioned — it is certainly the most important, but by no means the only one for dry zones; *E. tereticornis*, *E. citriodora, E. occidentalis, E. microtheca* and *E. urophylla*, among others, should be mentioned. This is followed by vegetation and climatic maps of West Africa, and a brief profile of vegetation types. Research stations and contacts and a brief bibliography complete the book.

The price of $6.50 seems high for this publication, though presumably many of the people it aims to reach obtain copies free of charge. It is heavily weighted toward botanical identification from other published sources, but is generally sound in its

recommendations. It should not be used as a sole guide however, even in West Africa; there are several important titles omitted from its list of references which would be of value to workers in dry-zone forestry. But it is a helpful manual, and, if it encourages tree planting in the Sahel, will have served a most useful purpose.

P.J. Wood
Appropriate Technology, London

A basic pulp and paper text

Pulp technology and treatment for paper, by James d'A. Clark. Miller Freeman Publications Inc., San Francisco California, 752 pages, illustrated, 1978. Price: US$65.

James d'A. Clark, TAPPI Gold Medal winner in 1963 and chairman of the TAPPI Standards Committee for seven years, has written this book for both students and seasoned veterans of the industry. The first 10 chapters review the basic principles of pulp technology from the point of view of chemistry, colloid chemistry, physics, mechanics, carbohydrates, and the nature of fibres. Subsequent chapters make use of these principles to broaden the reader's papermaking horizon, presenting many original and practical tests, procedures, and instruments.

The author conveys numerous insights into fibre technology by combining salient aspects of his own and other investigators' recent work with advanced concepts of surface chemistry and the details of submicroscopic fibre structure revealed by the scanning electron microscope. Along the way, he unveils precise, new methods for tasks such as characterizing the performance of refiners and measuring fibre cohesiveness. He also gives a practical, low-cost and positive method for testing wet-web strength quickly and efficiently. The book concludes with time-saving suggestions for the acquisition and filing of scientific data.

The book contains 752 pages in 36 chapters and more than 400 photos, tables, and figures. It can be used as a comprehensive textbook for beginners or as a basic reference book.

Primer for wood preservation

Wood preservation, by B.A. Richardson. The Construction Press Ltd., Lancaster, England, 1978. 238 p.

This book provides a fairly comprehensive account of wood preservation, a subject by no means new, but which has received increasing attention with a growing consciousness throughout the world of the need for more efficient utilization and protection of natural resources of all kinds.

The material is presented in five chapters and three appendixes. The book opens with a brief history of the various preservation systems adopted from ancient times to the present day, and is followed by an account of many different kinds of fungal and insect attacks to which wood is subject. The succeeding two chapters deal with preservative techniques in current use, and chemicals used as preservatives. The concluding chapter is devoted to discussion of economically realistic preservation practices.

Tracing the history of various preservation systems, adopted from early times to the present day, there are references to use of bitumen by ancient Egyptians (2000 B.C.) for preserving coffins and the use of cedar oil by Romans to protect wood from decay. The author makes the point that interest in wood preservation received stimulus from the frantic search for suitable preservatives to protect ships from marine borers and decay, particularly by the British Navy. It gained further during the second quarter of the 19th century, with widespread expansion of railways and use of wooden sleepers (that decayed rapidly) to support the rails.

In Chapter II the author discusses the causes of degradation of wood and describes the agents that are responsible for it.

There is a detailed discussion of the conditions necessary for development of fungi and destroying bacteria, and on the effect of decay on wood properties. Insects capable of seriously damaging wood, such as termites, bark-borers, powder-post beetles, and marine borers, are also discussed. There is a short discussion of changes in moisture content of wood and its influence on wood properties.

In Chapter III the author goes at some length into modern processes employed to protect wood from decay and insect attack, which are classified roughly as either pressure or non-pressure processes.

The more widely recognized non-pressure processes for treating wood involve brushing or spraying, dipping, soaking, steeping, diffusion and hot and cold baths; and there is a brief description of each of these processes. Miscellaneous non-pressure treatments such as charring, applying preservative in bored holes, setting timber in stones or concrete, and taking structural precautions to ensure that wood remains dry are briefly touched upon. For example, it is pointed out that immersion treatments are most suitable for applying low viscosity organic solvent preservatives to dry wood (preservative penetration and loading are good provided adequate time is available), but are unsuitable for use with rapid fixing preservatives.

The pressure processes of wood preservation in which wood is placed in a treatment cylinder or retort and impregnated with preservatives under pressure are explored at more length.

The author acquaints the reader with the general procedure of the full-cell process (such as the Bethell process) and the empty-cell process (such as the Lowry and Rueping processes).

Discussing the capability of wood to withstand fire and excessive heat, it is pointed out that, even though wood is combustible, fire resistance is best achieved in a building by using wood of adequate thickness as well as by fire retardant treatment. Fire retardant chemical treatment is briefly discussed.

This is a practical book and will be of interest and value to all those interested in becoming acquainted with wood preservation. The lack of bibliography and references to specific statements in the text has, however, impaired the utility of the book.

P. Argal

In Memoriam

Egon Glesinger's contribution to international forestry and FAO

by Gunnar Myrdal

Egon was a lifelong intimate friend and in some periods also a close collaborator.

We flrst met when, for the academic year 1930-31, I served as assistant professor at the Institut Universitaire de Hautes Etudes Internationales in Geneva. Egon was then completing his voluminous and valuable doctoral thesis on the European forestry industry, *le bois en Europe*. He participated in a seminar I led on the Great Depression, which had then spread to Europe and was worsening. I retain memories of his brilliant analytical conception of what was happening.

In 1931, our personal relations had become so close that Egon, finished with his doctoral studies, decided to come to Sweden, where he rapidly developed effective relations with the leading personalities in the forestry and pulp and paper industries. In Sweden he also found his life companion, Ruth.

Egon was born into a very rich Jewish family with immense holdings of forests and related wood industries in Teschen, a region on both sides of the boundary between Poland and Czechoslovakia. He told me that he was pressed to come home and prepare himself to head the forestry empire of his family. Egon, however, wanted instead to devote himself to serving the more general and international interest of organizing producers and consumers of timber products in all Europe. Though we never discussed it in detail, I gathered that this decision caused something of a break with his family and particularly with his father.

Bringing together the interested parties he succeeded in forming the Comité International du Bois in the 1930s. I recall that be reckoned it as a major accomplishment to have brought the Russians into cooperation within the new organization, instead of their becoming, as was feared at that time, disrupting outsiders. Their incorporation into the new organization was a major factor in the maintaining of the relative stability of trade and prices in Europe in the field of forestry and wood products in the period between the two world wars.

After the outbreak of World War II, Egon moved the headquarters from Vienna to Brussels and then to Geneva, but could not, of course, prevent its collapse. Egon and Ruth then finally came to the United States.

This was the time when the preparations were going on for the creation of the worldwide organization that was to become FAO. Egon was working toward having forestry and wood industries included as a major field of activity of FAO. This met with much resistance from many quarters and was rejected by the formative FAO conference at Hot Springs, Virginia, in April 1943. After this meeting, an interim commission was established to create FAO's operating procedures. Lester B. Pearson, later Prime Minister of Canada, was the chairman of this commission. Egon gradually succeeded in getting Pearson, Frank L. McDougall, the influential Australian member of the commission, and others to reverse the Hot Springs decision and include forestry in the FAO. He called on Clarence Forsling, of the US Forest Service and together they formed an informal group of international foresters and forestry-minded persons, including Lyle Watts, Chief of the US Forest Service, to support forestry in the FAO. The US representative on the Commission, Under Secretary of Agriculture Paul H. Appleby, hesitated to go against the Hot Springs decision. He was prevailed upon to consult with Dean Acheson, then US Assistant Secretary of State, who replied "by all means, forestry should be included" and finally with President Franklin Roosevelt, who personally approved it, sending back Appleby's letter with a note scrawled on it: "Yes — I think forestry should be included. FDR." The result was that FAO got a Forestry and Forest Products Division. Its first Director was Marcel Leloup and Egon was his deputy. Later Egon succeeded Leloup as Director. His entire working life made him eminently qualified for his contributions to international forestry and FAO.

Egon was a dynamic person and when I became Executive Secretary of the UN Economic Commission for Europe (ECE) in 1947 it was natural that I should turn to my old friend for advice and collaboration.

According to ECE's terms of reference, both agriculture and the forestry industries were, of course, under its responsibility, as well as that of FAO. Instead of following the unfortunate pattern of interagency rivalry and jealousy, which have become so prevalent among inter-governmental organizations, Egon and I made up our minds that the ECE and FAO should work together. And we got the unreserved support of John Boyd Orr, the first Director General of FAO, and also that of Lord Bruce of Melbourne who was at that time an effective Chairman of FAO's Council.

Together we developed an organizational scheme, according to which the regional economic commissions — of which ECE was the first one — should serve as FAO's regional agency in Europe; ECE should establish committees for work on the problems in Europe, which would be serviced by FAO officials. Thus ECE had a Timber Committee and later an Agricultural Committee, both with subcommittees and working parties to the extent needed for their practical work, and they were subordinate to both organizations.

For FAO this had the special advantage that it got its work in Europe integrated into ECE's general work on the economy of Europe. Another advantage was that as the Soviet Union was a member of ECE and gradually came to cooperate more

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actively in its committees, FAO could extend its work to include also Russia, though the Soviet Union refrained from joining the FAO. For ECE this cooperation implied that we had all the expert knowledge that could be mobilized in FAO at our disposal when working on European economic problems.

As Executive Secretary of ECE, I, of course, came to rely on my old friend Egon much more generally. Besides his responsibilities in FAO he became an effective member of my group of directors and, indeed, of my Central Office, whenever he came to Geneva.

Throughout his life Egon focused on the great international problems that he began to deal with as a youth in Geneva. He was often controversial, and sometimes disliked but always respected. He counted among his personal friends many leading international figures, including three heads of the United Nations: Trigve Lie, Dag Hammarskjöld and Kurt Waldheim. He remained active in international development work almost to the end, and one of the last letters he received was from Secretary General Waldheim and concerning his work as a consultant to help found an Indonesian pulp mill with the cooperation of the UNDP.

At one time when he was just leaving his duties with FAO, we made a plant that we two, working together, would write a book on the deterioration of the various intergovernmental organizations within the UN family, which we had anxiously been watching from inside and from outside. That plan we were not able to fulfill, although I still have preserved outlines and sketches of manuscripts by Egon and myself.

To me personally the death of Egon Glesinger is a tremendous loss. Let me point out some general traits in Egon's character — which, in the main, he retained over the years and decades.

He was born as a favored son in a very wealthy family and was accustomed to a grandiose life style. But he never cared much about money, although obviously having enough of it, and was always generous, not to say lavish, in his relationships with his friends. I have already mentioned that when he was urged to come home to be prepared to head a great private economic empire, he preferred to serve the common public interest.

In the revolutions following World War II, the family fortune was lost, but I never heard him take this very seriously. When he changed his citizenship from Czechoslovakian to Austrian, this was not a radical break but rather a conservative move, as his and his whole family background was the old Austro-Hungarian empire with its conglomerate of peoples and cultures. He always felt himself very much at home in what was left of it in Austria, for which he showed a real patriotism.

Egon was born an optimist and remained an optimist throughout his life. When a project of his met with failure, he immediately had a new scheme for reaching the goal he was pursuing.

Sometimes I felt that he was unrealistically over-optimistic. When Hitler took power in Germany, Egon happened to be in Stockholm. I remember he believed that the Nazi craziness would rapidly meet defeat, while I was filled by forebodings of horrible things to come.

But this over-optimism was not to any degree an opportunistic adjustment. I remember from these days that Egon, who was the opposite of a religious conformist, took with him his hat and went to the synagogue, probably for the first time in decades. This was his protest, his way of expressing his hatred of nazism, even if he minimized in his own opinion what it would come to imply for the Jews in Germany, for Germany itself and for the world.

Though his mind was always full of schemes he was never a cheap intriguer of the type that flourishes among the frustrated secretariats of intergovernmental organizations. I never found him deceitful or betraying a righteous cause he was pursuing.

He was always deeply honest in his strivings, which never were directed toward his own personal advantage but always toward a general purpose. In that sense he remained intellectually and emotionally an aristocrat, who could afford to be unselfish. ■

Egon Glesinger, who was instrumental in bringing forestry into the FAO and was the founder of the Comité International du Bois, died in Rome on June 27, 1979 at the age of 72.

Dr. Glesinger was Assistant Director General in charge of the Department of Public Relations and Legal Affairs when he retired from FAO in 1969. Before that he was Director of the Forestry and Forest Products Division, and he returned to forestry activities as a consultant for the United Nations Development Programme after leaving FAO.

He was born in Český-Těšín, now on the Czechoslovak side of the border with Poland, but then part of the Austro-Hungarian empire.

After earning a degree in law from the University of Prague and a diploma in commercial science, Glesinger's impressive thesis for his doctorate in political science from the University of Geneva brought him to the attention of international agricultural economists.

He formed the Comité International du Bois (CIB), which was made up of European wood exporters and which worked at getting quota agreements in a very competitive market and promoting wood products to increase export and domestic sales. The CIB pioneered in the collection of forest products trade statistics. With the coming of World War II it collapsed and Dr. Glesinger and his wife Ruth went to the United States.

There he joined the National Lumber Company and then the staff of *Fortune* magazine. As consultant to the State of North Carolina he drafted a post-war programme for its forest industries. He also wrote two books during this period, *Nazis in the woodpile*, published in 1942, which aimed at showing the importance Germany gave to wood as an essential war material, and *The coming age of wood*, which came out in 1947 and hailed the many uses and the economic importance of wood for the post-war world.

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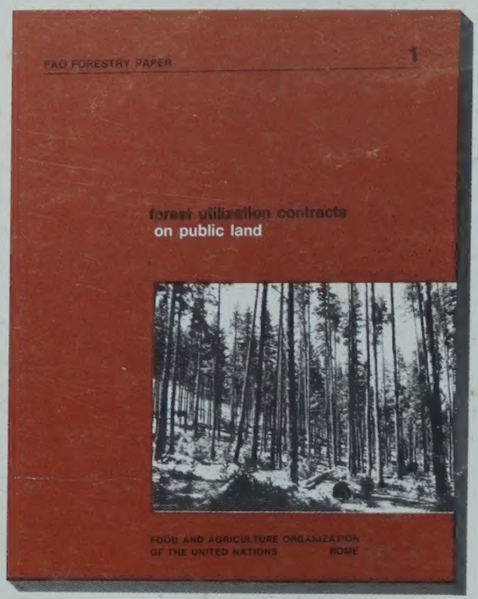

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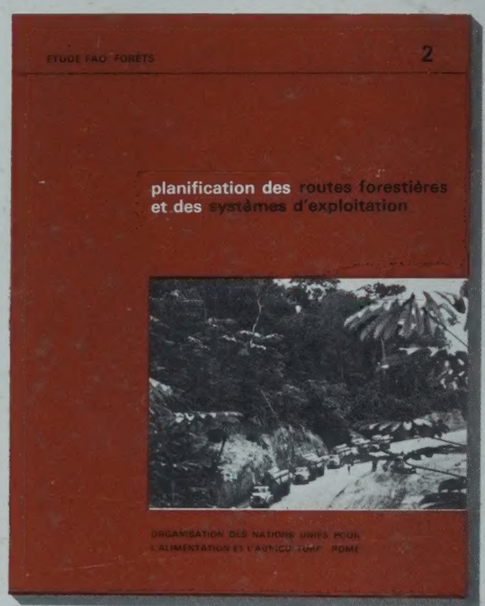

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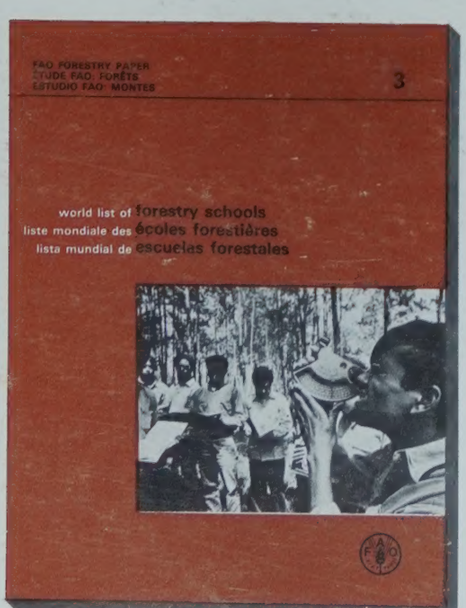

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